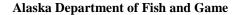
Project Report to the Aleutians East Borough Summarizing Results of the 2013–2016 South Peninsula Exploratory Tanner Crab Trawl Survey

by

Kally Spalinger

April 2017



Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative		all standard mathematical	
deciliter	dL	Code	AAC	signs, symbols and	
gram	g	all commonly accepted		abbreviations	
hectare	ha	abbreviations	e.g., Mr., Mrs.,	alternate hypothesis	H_A
kilogram	kg		AM, PM, etc.	base of natural logarithm	e
kilometer	km	all commonly accepted		catch per unit effort	CPUE
liter	L	professional titles	e.g., Dr., Ph.D.,	coefficient of variation	CV
meter	m		R.N., etc.	common test statistics	$(F, t, \chi^2, etc.$
milliliter	mL	at	@	confidence interval	CI
millimeter	mm	compass directions:		correlation coefficient	
		east	E	(multiple)	R
Weights and measures (English)		north	N	correlation coefficient	
cubic feet per second	ft ³ /s	south	S	(simple)	r
foot	ft	west	W	covariance	cov
gallon	gal	copyright	©	degree (angular)	0
inch	in	corporate suffixes:		degrees of freedom	df
mile	mi	Company	Co.	expected value	E
nautical mile	nmi	Corporation	Corp.	greater than	>
ounce	OZ	Incorporated	Inc.	greater than or equal to	≥
pound	lb	Limited	Ltd.	harvest per unit effort	HPUE
quart	qt	District of Columbia	D.C.	less than	<
yard	yd	et alii (and others)	et al.	less than or equal to	≤
		et cetera (and so forth)	etc.	logarithm (natural)	ln
Time and temperature		exempli gratia		logarithm (base 10)	log
day	d	(for example)	e.g.	logarithm (specify base)	log _{2,} etc.
degrees Celsius	°C	Federal Information		minute (angular)	•
degrees Fahrenheit	°F	Code	FIC	not significant	NS
degrees kelvin	K	id est (that is)	i.e.	null hypothesis	H_{O}
hour	h	latitude or longitude	lat or long	percent	%
minute	min	monetary symbols		probability	P
second	S	(U.S.)	\$, ¢	probability of a type I error	
		months (tables and		(rejection of the null	
Physics and chemistry		figures): first three		hypothesis when true)	α
all atomic symbols		letters	Jan,,Dec	probability of a type II error	
alternating current	AC	registered trademark	®	(acceptance of the null	
ampere	A	trademark	TM	hypothesis when false)	β
calorie	cal	United States		second (angular)	"
direct current	DC	(adjective)	U.S.	standard deviation	SD
hertz	Hz	United States of		standard error	SE
horsepower	hp	America (noun)	USA	variance	
hydrogen ion activity	pН	U.S.C.	United States	population	Var
(negative log of)			Code	sample	var
parts per million	ppm	U.S. state	use two-letter		
parts per thousand	ppt,		abbreviations		
	‰		(e.g., AK, WA)		
volts	V				
watts	W				

REGIONAL INFORMATION REPORT NO. 4K17-02

PROJECT REPORT TO THE ALEUTIANS EAST BOROUGH SUMMARIZING RESULTS OF THE 2013–2016 SOUTH PENINSULA DISTRICT EXPLORATORY TANNER CRAB TRAWL SURVEY

by
Kally Spalinger
Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak

Alaska Department of Fish and Game Division of Sport Fish, Research and Technical Services 333 Raspberry Road, Anchorage, Alaska, 99518-1565 The Regional Information Report Series was established in 1987 and was redefined in 2007 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as area management plans, budgetary information, staff comments and opinions to Alaska Board of Fisheries proposals, interim or preliminary data and grant agency reports, special meeting or minor workshop results and other regional information not generally reported elsewhere. Reports in this series may contain raw data and preliminary results. Reports in this series receive varying degrees of regional, biometric and editorial review; information in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author or the Division of Commercial Fisheries if in doubt of the level of review or preliminary nature of the data reported. Regional Information Reports are available through the Alaska State Library and on the Internet at: http://www.adfg.alaska.gov/sf/publications/.

Kally Spalinger Alaska Department of Fish and Game, Division of Commercial Fisheries, 351 Research Court, Kodiak, AK 99615, USA

This document should be cited as follows:

Spalinger, K. 2017. Project report to the Aleutians East Borough summarizing results of the 2013–2016 South Peninsula District exploratory Tanner crab trawl survey. Alaska Department of Fish and Game, Regional Information Report 4K17-02, Kodiak.

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility please write: ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

The department's ADA Coordinator can be reached via phone at the following numbers: (VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648,

-60//, (Statewide Telecommunication Device for the Dear) 1-800-4/8-364 (Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

For information on alternative formats and questions on this publication, please contact: ADF&G Division of Sport Fish, Research and Technical Services, 333 Raspberry Road, Anchorage AK 99518 (907) 267-2375.

TABLE OF CONTENTS

LIST OF TABLES	Page
LIST OF FIGURES	
ABSTRACT	
INTRODUCTION	1
METHODS	2
Trawl Description and Procedures	2
Catch Sampling Procedures	2
Tanner Crab Abundance Estimation	3
RESULTS	4
2013 Trawl survey of Unimak Bight	4
Catch Composition	4
Tanner Crab	
Comparison of Unimak Bight Hauls to Sanak Island Survey Hauls, 2013	
Catch Composition	
Tanner Crab	
Comparison of Unimak Bight Hauls to Sanak Island Survey Hauls, 2014	5
2015 Trawl survey west of Cherni Island and southwest of Kupreanof Peninsula	
Catch Composition	
Tanner Crab	
Comparison of Kupreanof Peninsula Hauls to Stepovak Bay Survey Hauls, 2015	7
2016 Trawl survey west of Cherni Island	8
Catch Composition	8
Tanner Crab	
DISCUSSIONDISCUSSION	
2013 Survey	
2014 Survey	
2015 Survey	
2016 SurveyACKNOWLEDGEMENTS	
REFERENCES CITED	
TABLES	
FIGURES	28

LIST OF TABLES

Table	I	Page
1.	Weight of catch in kilograms by haul from the exploratory survey area of Unimak Bight and the	0
	standard survey area of Sanak Island, 2013 trawl survey.	15
2.	Number of male and female Tanner crab captured by haul from the exploratory survey area of Unimak	
	Bight and the standard survey area of Sanak Island in 2013.	
3.	Tanner crab abundance estimates by station from Unimak Bight and Sanak Island, 2013 trawl survey	17
4.	Weight of catch in kilograms by haul from the exploratory survey area of Unimak Bight and the	
	standard survey area of Sanak Island, 2014 trawl survey	
5.	Number of male and female Tanner crab captured by haul from the exploratory survey area of Unimak	
_	Bight and the standard survey area of Sanak Island in 2014.	
6.	Tanner crab abundance estimates by station from Unimak Bight and Sanak Island, 2014 trawl survey.	
7.	Weight of catch in kilograms by haul from the exploratory survey areas of Cherni Island and southwest	Į.
	Kupreanof Peninsula and the standard survey areas of Sanak Island, Morzhovoi Bay, and Stepovak	21
8.	Bays, 2015 trawl survey	
0.	Island and southwest Kupreanof Peninsula and from the standard survey areas of Sanak Island,	
	Morzhovoi Bay and Stepovak Bay, 2015 trawl survey.	22
9.	Tanner crab abundance estimates by station from Cherni and Sanak islands and Morzhovoi Bay, 2015	44
7.	trawl survey.	23
10.	Tanner crab abundance estimates by station from Kupreanof Peninsula and Stepovak Bay, 2015 trawl	25
10.	survey	24
11.	Weight of catch in kilograms by haul from the exploratory survey area of Cherni Island and the	
	standard survey areas of Sanak Island and Morzhovoi Bay, 2016 trawl survey.	25
12.	Number of male and female Tanner crab captured by haul caught from the exploratory survey area of	
	Cherni Island and from the standard survey areas of Sanak Island and Morzhovoi Bay, 2016 trawl	
	survey.	26
13.	Tanner crab abundance estimates by station from Cherni and Sanak islands and Morzhovoi Bay, 2016	
	trawl survey.	27
	LIST OF FIGURES	
	LIST OF FIGURES	
Figure	e I	Page
1.	Map of the South Peninsula District showing standard and exploratory survey stations	
2.	South Peninsula District exploratory trawl survey grid showing stations in Unimak Bight and west of	
	Cherni Island.	30
3.	South Peninsula District exploratory trawl survey grid showing stations southwest of Kupreanof	
	Peninsula.	31
4.	Unimak Bight exploratory station haul locations in 2013 and 2014, including haul numbers	32
5.	Cherni Island exploratory station haul locations in 2015 and 2016, including haul numbers	
6.	Southwest Kupreanof Peninsula exploratory station haul locations in 2015, including haul numbers	34
7.	Tanner crab male and female carapace width frequencies from Unimak Bight and Sanak Island, 2013	
	trawl surveys.	
8.	Top ten species by weight from trawl survey hauls in Unimak Bight and Sanak Island, 2014	36
9.	Tanner crab male and female carapace width frequencies from Unimak Bight and Sanak Island, 2014	
4.0	trawl surveys.	
10.	Size frequency of male Tanner crab in Unimak Bight by shell condition, 2014	
11.	Size frequency of juvenile and mature female Tanner crab in Unimak Bight, 2014	
12.	Total abundance estimates of Tanner crab in Unimak Bight, 2014	40
13.	Top ten species by weight from trawl survey hauls at Cherni and Sanak islands, Morzhovoi and	11
14.	Stepovak bays, and Kupreanof Peninsula, 2015.	41
14.	Tanner crab male and female carapace width frequencies from Cherni Island, Sanak Island, and Morzhovoi Bay, 2015 trawl surveys.	42
15.	Size frequency of male Tanner crab west of Cherni Island and southwest of Kupreanof Peninsula by	+∠
15.	shell condition, 2015.	43

LIST OF FIGURES (Continued)

Figure		Page
16.	Tanner crab male and female carapace width frequencies from southwest Kupreanof and Stepovak	
	Bay, 2015 trawl surveys.	44
17.	Size frequency of juvenile and mature female Tanner crab west of Cherni Island and southwest of	
	Kupreanof Peninsula, 2015.	45
18.	Total abundance estimates of Tanner crab west of Cherni Island, 2015.	46
19.	Total abundance estimates of Tanner crab southwest of Kupreanof Peninsula, 2015	47
20.	Top ten species by weight from trawl survey hauls at Cherni and Sanak islands and Morzhovoi Bay,	
	2016	48
21.	Tanner crab male and female carapace width frequencies from Cherni and Sanak islands and	
	Morzhovoi Bay, 2016 trawl survey.	49
22.	Size frequency of male Tanner crab west of Cherni Island by shell condition, 2016.	50
23.	Size frequency of juvenile and mature female Tanner crab west of Cherni Island, 2016	51
24.	Total abundance estimates of Tanner crab west of Cherni Island, 2016.	

ABSTRACT

Exploratory bottom trawl hauls were conducted by Alaska Department of Fish and Game (ADF&G) in areas of the South Peninsula Tanner crab management district previously unsurveyed by ADF&G large-mesh bottom trawl surveys to assess the presence of commercially important crab and groundfish species. Funding was provided by the Aleutians East Borough. Trawl hauls were conducted in Unimak Bight in 2013 and 2014, southwest of Kupreanof Peninsula in 2015, and west of Cherni Island in 2015 and 2016. Trawl hauls were evaluated for species catch composition, abundance estimates of commercially important crabs, and catch per unit effort (CPUE) of commercially important groundfish. The estimated legal male Tanner crab *Chionoecetes bairdi* abundance was low in each of the three areas and arrowtooth flounder *Atheresthes stomias* and flathead sole *Hippoglossoides elassodon* dominated the groundfish catch. The sizes of Tanner crab captured from these areas were similar to sizes of crab captured from nearby annually surveyed areas, but the number of crab captured was lower in Unimak Bight and Cherni Island and higher southwest of Kupreanof Peninsula. Based on 2013–2016 survey data, inclusion of these exploratory survey areas would not substantially change the abundance estimate of Tanner crab in the South Peninsula District.

Key words: Tanner crab, groundfish, *Chionoecetes bairdi*, trawl survey, South Peninsula, Unimak Bight, Sanak Island, Cherni Island, Morzhovoi Bay, Stepovak Bay, Kupreanof Peninsula

INTRODUCTION

The first ADF&G trawl survey to assess crab populations in the South Peninsula District was in Pavlof Bay in 1983 (Colgate 1983). In 1988 trawl surveys became the standard Tanner crab stock assessment tool in the district (Urban and Vining 1999). Since then, between 89 and 132 successful trawl hauls have been completed in the South Peninsula District annually during the large-mesh bottom trawl survey (Figure 1; Spalinger 2016).

In 1999, in response to Alaska Board of Fisheries regulation (5 AAC 35.080), ADF&G developed a Tanner crab harvest strategy and set minimum abundance thresholds for opening the commercial Tanner crab fishery in the South Peninsula District (Urban et al. 1999). The abundance threshold was defined as one half of the long-term average abundance of mature males (carapace width ≥115 mm; Urban and Vining 1999). Tanner crab guideline harvest levels (GHLs) are primarily determined by estimating the number of molting mature male crab in a section of the South Peninsula District and applying a harvest rate based on composition of the male population. Additional precautionary measures within the harvest strategy ensure conservative management when stocks are rebuilding (Urban and Vining 1999). The Tanner crab fishery was closed due to low abundance in the South Peninsula District from 1990 to 2000, from 2002 to 2004, and from 2014 to 2017.

Beginning in 2013, the Aleutians East Borough (AEB) expressed interest in expanding area surveyed during the Alaska Department of Fish and Game (ADF&G) bottom trawl survey of the South Peninsula Tanner crab *Chionoecetes bairdi* management district (5 AAC 35.505 (b)) to include Unimak Bight (Figure 1) to determine if commercially viable quantity of Tanner crab exist. In 2013 ADF&G conducted test hauls and identified potential trawl locations. Through a cooperative agreement (14-108) between Aleutians East Borough and ADF&G the survey area was expanded in 2014, 2015, and 2016.

The 2013–2016 South Peninsula District trawl surveys occurred during July and August in areas of known Tanner crab habitat consistent with past trawl surveys. As Tanner crab may occur in areas not currently assessed by the survey, this project conducted test hauls and expanded trawl sampling in 2013 and 2014 to waters of Unimak Bight, in 2015 to waters southwest of Kupreanof Peninsula, and in 2015 and 2016 to waters between Sanak Island and Morzhovoi Bay

west of Cherni Island to determine presence of Tanner crab (Figures 2–3). These areas historically have not been included in the standard trawl survey of the South Peninsula District or when setting abundance thresholds or determining GHLs in the district.

The primary objective of the 2013–2016 exploratory trawl hauls in the South Peninsula District was to estimate the abundance and condition of commercially important crab species, specifically Tanner crab, outside of the existing survey area. Secondary objectives in 2014–2016 included determining species composition, length frequency distributions, and CPUE (kg/km towed) of commercially important groundfish in the area.

METHODS

TRAWL DESCRIPTION AND PROCEDURES

Since 1988 ADF&G has surveyed areas of historic Tanner crab abundance utilizing the research vessel *Resolution* (27.4 m). There were a total of 27 additional bottom trawl hauls completed in the South Peninsula District between 2013 and 2016; 3 in Unimak Bight in 2013 and 11 in 2014 (Figure 4), 3 west of Cherni Island in 2015 and 7 in 2016 (Figure 5), and 3 southwest of Kupreanof Peninsula in 2015 (Figure 6).

Trawlable area was determined using a combination of multi-beam sonar mapping and navigational software available on the R/V *Resolution*. Based on bottom depth contours and measurements of bottom hardness, the most promising areas for making successful bottom trawls were identified, and exploratory survey stations were generated using a standard station size of 5 minutes latitude by 9 minutes longitude to cover the areas of interest (Figures 2 and 3).

The trawl survey net used is a 400-mesh eastern otter trawl designed to sweep a 12.2 m path. The net mouth is constructed with 10.2 cm stretch mesh, net body with 8.9 cm stretch mesh, and the codend with a 3.2 cm stretch mesh liner. The net has a 21.3 m headrope with 18 floats 20.3 cm in diameter. The footrope is 29.0 m long with a 1.0 cm diameter chain attached every 25.4 cm to ensure the footrope tends bottom. The dandylines are 45.7 m long, each consisting of an 18.3 m section of 1.5 cm cable and a pair of 27.4 m sections of 1.3 cm cable, one attached to the top and the other to the bottom of each net wing (Spalinger 2015b). Astoria "V" type doors weighing 340 kg and measuring 1.5 m x 2.1 m are used to spread the net.

Within a station the trawl net was towed on bottom at an average speed of 4.9 km per hour for 1.85 km (1 nmi). The haul length, or distance towed, provided a representative sample of fishery resources from each station without exceeding weight limitations of vessel equipment. Irregular bottom type, net hang ups, or exceptionally large catches occasionally caused haul length to differ from 1.85 km. Haul length was determined by Global Positioning System and is assumed to be the distance traveled over the ground by the vessel from when the footrope contacts bottom until the footrope leaves bottom. The vessel captain estimated corrections in distance for hauls that were not straight. Haul location was limited to trawlable substrate and hauls were made during daylight hours. Quality of net performance was rated and a haul was discarded and repeated when the skipper and cruise leader determined the net did not adequately sample the bottom (Spalinger 2015b).

CATCH SAMPLING PROCEDURES

Total catch weight from each haul was determined by weighing the full trawl codend with an electronic crane scale (± 1.0 kg), emptying the codend into on-deck sorting bins, and subtracting

the empty codend weight from the full codend weight. Prior to emptying trawl catch from the codend, a 1.5 m² subsampling net was tied into the on-deck sorting bin. After emptying the entire catch into the on-deck sorting bin, the subsampling net was lifted by crane through the catch (subsample) and placed on the sorting table for species composition sampling.

Length or width measurements were taken from selected finfish and shellfish species. Measurements and biological data were entered directly into onboard databases. Finfish were measured from snout to mid-point of the caudal fin. Skates *Raja* spp. and *Bathyraja* spp. were measured along the dorsal surface from the snout to the anterior notch of the pectoral fin and sex was determined. When available, a minimum of 20 weathervane scallops *Patinopectin caurinus* from each haul were measured for shell height following methods detailed in Spalinger (2015b).

Tanner crab carapace width (CW) was measured perpendicular to the carapace midline, between the lateral margin spines; however, legal status (minimum size requirement to retain in a fishery) was determined including lateral margin spines. Dungeness crab *Metacarcinus magister* were measured for CW and checked for legal status across the carapace immediately anterior to the tenth anterolateral spine. All crabs were categorized by shell condition. Clutch fullness of mature female Tanner and Dungeness crabs was estimated by examining egg clutch and assigning a fractional clutch size relative to the size of the abdominal flap (Spalinger 2015b). Additionally, clutch condition aspects such as the amount of dead eggs present, the absence of eggs, the condition of the pleopods, and embryo development, noted by the presence or absence of eyed eggs, were recorded.

The test hauls conducted in Unimak Bight during 2013 were made while using multi-beam sonar to identify potential haul locations for the following years work, and catch sampling procedures were modified in order to spend more time exploring the area. Total catch weight was determined for each haul and all Tanner crab were sorted by sex, weighed, measured, and biological information recorded; however, species composition of the catch was not determined and finfish measurements were not collected.

TANNER CRAB ABUNDANCE ESTIMATION

Abundance indices for Tanner crab were derived from trawl survey data using the area swept technique (Alverson and Pereyra 1969). Survey catch data was converted to density estimates for each haul by dividing the number or weight of animals caught in the haul by the area swept by the trawl during the haul. The area swept is the product of the assumed net width of 12.2 m and the distance towed. Density estimates were multiplied by the station area to estimate station abundance. The sum of abundances from stations in a geographic area provided a total abundance index for the area. Abundance estimates for hauls made in the same station during the same year were averaged. Catches for all other species were standardized to kg per km towed. Data from exploratory stations are then compared to the geographically closest standard trawl survey stations by year.

RESULTS

2013 TRAWL SURVEY OF UNIMAK BIGHT

In Unimak Bight, within the South Peninsula Tanner crab District, 2 stations were sampled with 3 test hauls completed on August 22, 2013 (Figure 4). The total area used to determine Tanner crab abundance estimates for Unimak Bight in 2013 was 177.1 km². Hauls averaged 1.9 km long with an average depth of 59 fathoms.

Catch Composition

CPUE of all species from hauls in Unimak Bight during 2013 was 142 kg/km towed. The average total animal weight per haul was 263 kg and the average Tanner crab weight per haul was 0.14 kg, less than 1% of the overall catch (Table 1).

Tanner Crab

A total of 47 Tanner crab were captured in Unimak Bight in 2013, ranging from 0 to 28 crab per haul (Table 2). All crab captured were juveniles averaging 27.6 mm CW for males (range 23–35 mm CW) and 30.6 mm CW for females (range 23–64 mm CW; Figure 7). All crab had new shells except for 1 female crab that was soft shell. Total Tanner crab abundance estimated from 2 stations in Unimak Bight was 147,020 crab (Table 3).

Comparison of Unimak Bight Hauls to Sanak Island Survey Hauls, 2013

As part of the standard 2013 trawl survey, 7 tows were conducted north of Sanak Island (Spalinger 2014, Figure 1). This was the closest survey area to Unimak Bight and summarized results from Sanak Island hauls were compared to Unimak Bight exploratory survey hauls. The average animal catch weight from Sanak Island hauls was 473 kg per haul (Table 1) compared to 263 kg per haul from Unimak Bight, with a higher average catch of Tanner crab at 2.8 kg per haul from Sanak Island.

Sanak Island hauls had an average catch of 57 Tanner crab per haul (Table 2), over three times the average of 16 crab per haul caught in Unimak Bight. The crab from Sanak in 2013 averaged 42.4 mm CW for males (range12–150 mm CW) and 37.2 mm CW for females (range 19–95 mm CW; Figure 7). The majority of crab were juveniles, although mature males and females were also captured.

Tanner crab density was higher around Sanak Island (10,823 crab/nmi²), compared to the density estimate from Unimak Bight (2,380 crab/nmi²), resulting in higher Tanner crab abundance estimates for Sanak Island stations (Table 3). The area considered when determining abundance for Sanak (445.6 km²; Spalinger 2014) was approximately 2.5 times the area considered for the stations sampled in Unimak Bight (177.1 km²). No legal male Tanner crab were captured in 2013 at Unimak Bight, while the legal male Tanner crab density around Sanak Island was 163 legal males/nmi².

2014 TRAWL SURVEY OF UNIMAK BIGHT

In Unimak Bight, 11 hauls were completed on August 9 and 10, 2014 (Figure 4). The total area used to determine Tanner crab abundance estimates for Unimak Bight in 2014 was 900.2 km². Hauls averaged 1.7 kilometers long with an average depth of 52 fathoms.

Catch Composition

CPUE of all species from hauls in Unimak Bight during 2014 was 411 kg/km towed. Arrowtooth flounder *Atheresthes stomias* was the dominant species caught by weight (25.7%), followed by flathead sole *Hippoglossoides elassodon* (14.8%), and walleye pollock *Gadus chalcogrammus* (14.4%; Figure 8). The average total animal weight per haul was 704 kg and the average Tanner crab weight per haul was 0.72 kg (Table 4), making Tanner crab 29th out of 55 species caught by weight and less than 1% of the overall catch.

Tanner Crab

Tanner crab were captured in 91% of Unimak Bight hauls in 2014, with catches ranging from 0 to 20 crab per haul (Table 5). Most of the crab captured were juveniles with the exception of 7 mature females and 4 mature males.

Average Tanner crab size was 66.3 mm CW for males (range 18–156 mm CW) and 49.5 mm CW for females (range 21–95 mm CW; Figure 9). All male Tanner crab greater than 90 mm CW had old or very old shells, and all mature males (>114 mm CW) had very old shells. Most juvenile males had new shells (Figure 10). Juvenile male crab and female Tanner crab were found across Unimak Bight and egg clutches of 7 mature female Tanner crab were examined: 85.7% of mature females were in new shell condition (Figure 11) and had an egg clutch that was half full or less.

Mature and legal males were only captured in three stations (Figure 12). The total abundance of Tanner crab from the surveyed area of Unimak Bight was estimated at 267,620 crab, comprised mostly of juveniles (Table 6).

Comparison of Unimak Bight Hauls to Sanak Island Survey Hauls, 2014

As part of the standard 2014 trawl survey, 7 tows were conducted north of Sanak Island (Spalinger 2015a; Figure 1). The average animal catch weight from Sanak Island hauls was 417 kg per haul compared to 704 kg per haul from 11 stations in Unimak Bight; however Sanak Island had more Tanner crab, with an average catch of 10.7 kg per haul, comprising almost 3% of the overall catch (Table 4).

Sanak Island hauls had an average catch of 59 Tanner crab per haul (Table 5), almost ten times the average of 6 crab per haul caught in Unimak Bight. The crab from Sanak averaged 70.5 mm CW for males (range 6–169 mm CW) and 48.6 mm CW for females (range 10–90 mm CW; Figure 9), similar to the crab measured from Unimak Bight. Similarly, the majority of crab captured in Sanak were juveniles, although 28 mature females and 46 mature males were caught (compared to 7 and 4 from Unimak Bight).

Tanner crab density in 2014 was higher around Sanak Island (11,289 crab/nmi²), compared to the density estimate from Unimak Bight (938 crab/nmi²), resulting in higher Tanner crab abundance estimates for Sanak Island (Table 6). The area considered when determining abundance for Sanak (445.6 km²; Spalinger 2015a) was approximately 50% of the area considered for Unimak Bight (900.2 km²) in 2014. Legal male Tanner crab density in Unimak Bight in 2014 was 45 legal males/nmi², while Sanak Island density was 742 legal males/nmi².

Both areas had arrowtooth flounder, flathead sole, and walleye pollock as the top 3 species; however, Sanak Island had a substantially higher proportion of arrowtooth flounder and flathead

sole (Figure 8). A total of 55 species were identified from Unimak Bight hauls and 39 species from Sanak Island hauls.

2015 TRAWL SURVEY WEST OF CHERNI ISLAND AND SOUTHWEST OF KUPREANOF PENINSULA

West of Cherni Island, 3 hauls were completed on August 9, 2015 (Figure 5). The total area used to determine Tanner crab abundance estimates in the area was 264.1 km². Hauls averaged 1.8 kilometers long with an average depth of 73 fathoms.

Southwest of Kupreanof Peninsula, 3 hauls were completed on August 17, 2015 (Figure 6). The total area used to determine Tanner crab abundance estimates in the area was 260.2 km². Hauls averaged 1.9 kilometers long with an average depth of 86 fathoms.

Catch Composition

CPUE of all species from hauls west of Cherni Island in 2015 was 538 kg/km towed. Arrowtooth flounder was the dominant species caught by weight (51.0%), followed by flathead sole (30.8%; Figure 13). The average total animal weight per haul was 963 kg and the average Tanner crab weight per haul was 4.35 kg, making it 13th out of 34 species caught by weight and less than 1% of the overall catch (Table 7).

CPUE of all species from hauls southwest of Kupreanof Peninsula in 2015 was 536 kg/km towed. Arrowtooth flounder was the dominant species caught by weight (65.7%), followed by flathead sole (17.5%; Figure 13). The average total animal weight per haul was 992 kg and the average Tanner crab weight per haul was 2.46 kg, making it 19th out of 29 species caught by weight and less than 1% of the overall catch (Table 7).

Tanner Crab

A total of 312 Tanner crab were captured in the exploratory areas of the South Peninsula District in 2015 (101 west of Cherni Island and 211 southwest of Kupreanof Peninsula; Table 8). A total of 11 mature females and 3 mature males were caught west of Cherni Island and only 2 mature females and 2 mature males were caught southwest of Kupreanof Peninsula. Tanner crab catch in each haul ranged from 13 to 109 crab per haul.

Average size of crab captured west of Cherni Island was 65.5 mm CW for males (range 21–144 mm CW) and 48.1 mm CW for females (range 23–99 mm CW; Figure 14). Of male crab ≥95 mm CW one-half were old or very old shell condition (Figure 15). Average size of crab captured southwest of Kupreanof Peninsula was 41.8 mm CW for males (range 20–116 mm CW) and 31.8 mm CW for females (range 16–95 mm CW; Figure 16). Shell composition of male crab was 76% new shell and 24% soft shell (Figure 15)

Egg clutches of 11 mature female Tanner crab from west of Cherni Island were examined: 54.5% of mature females were in old or very old shell condition (Figure 17) and 72.7% had egg clutches that were more than half full. Southwest of Kupreanof Peninsula, only 2 mature female Tanner crab were captured and examined. Both were in new shell condition and had an egg clutch that was half full or less.

Mature and legal males were captured at 2 of the 3 haul locations west of Cherni Island (Figure 18). Southeast of Kupreanof Peninsula, while crab were captured in each haul, mature males were only found in one location and there were no legal males captured (Figure 19). Total

abundance of Tanner crab west of Cherni Island was estimated at 404,554 crab (Table 9), and from the area southwest of Kupreanof Peninsula was 811,430 crab (Table 10).

Comparison of Cherni Island Hauls to Sanak Island and Morzhovoi Bay Survey Hauls, 2015

As part of the standard 2015 trawl survey, 7 hauls were conducted north of Sanak Island and 13 hauls in Morzhovoi Bay (Spalinger 2016), and compared to 3 hauls in the nearby area west of Cherni Island. Average animal catch weight was 340 kg per haul for Sanak Island, 1,581 kg per haul for Morzhovoi Bay, and 963 kg per haul for Cherni Island. Although Cherni Island had higher average catch weight of Tanner crab (4.35 kg per haul) than Sanak Island (1.51 kg per haul), the percent of catch that was Tanner crab was lower (0.38% west of Cherni Island vs. 0.72% north of Sanak Island). Morzhovoi Bay, which has the highest Tanner crab abundance in the South Peninsula District, averaged 156.07 kg of Tanner crab per haul and animal catch was composed of 8.26% Tanner crab (Table 7).

Sanak Island had an average catch of 45 Tanner crab per haul, higher than the average of 34 Tanner crab per haul west of Cherni Island. Morzhovoi Bay had a much higher number of Tanner crab per haul, averaging 578 crab (Table 8). The crab from Sanak in 2015 averaged 40.7 mm CW for males (range 17–145 mm CW) and 29.5 mm CW for females (range 20–82 mm CW). The crab from Cherni Island averaged 65.5 mm CW for males (range 21–144 mm CW) and 48.1 mm CW for females (range 23–99 mm CW). The crab from Morzhovoi Bay averaged 96.2 mm CW for males (range 22–162 mm CW) and 83.4 mm CW for females (range 25–113 mm CW; Figure 14). The majority of Tanner crab captured west of Cherni Island were juveniles (86.1%), a proportion in between what was captured in Morzhovoi Bay (74.3%) and Sanak Island (98.7%).

Tanner crab density in 2015 was highest in Morzhovoi Bay (89,788 crab/nmi²), compared to Sanak Island (7,429 crab/nmi²), and Cherni Island (5,290 crab/nmi²). Morzhovoi Bay had the highest abundance estimate, followed by Sanak Island and Cherni Island (Table 9). The area considered for the 13 stations sampled in Morzhovoi Bay (377.6 km²) was approximately 1.4 times greater than the area considered for the 3 Cherni Island stations (264.1 km²). Around Sanak, 7 stations were sampled and the area considered when determining abundance (445.6 km²; Spalinger 2016) was approximately 1.7 times greater than the area considered for the 3 stations west of Cherni Island. Morzhovoi Bay had the highest legal male Tanner density (2,045 crab/nmi²), followed by Cherni Island (105 crab/nmi²) and then Sanak Island (24 crab/nmi²).

Species composition west of Cherni Island and north of Sanak Island were similar, with arrowtooth flounder and flathead sole present in the largest proportions (Figure 13). The next most prevalent species by weight in the Cherni Island area were great sculpin *Myoxocephalus polyacanthocephalus* and walleye pollock, while at Sanak Island it was the common mud star *Ctenodiscus crispatus* and Pacific halibut *Hippoglossus stenolepis*. In contrast, Morzhovoi Bay had the highest proportion of flathead sole, followed by Tanner crab, walleye pollock, and Alaska plaice *Pleuronectes quadrituberculatus*.

Comparison of Kupreanof Peninsula Hauls to Stepovak Bay Survey Hauls, 2015

As part of the standard 2015 trawl survey, 5 hauls were conducted in the vicinity of Stepovak Bay (Spalinger 2016) and compared to results from the area southwest of Kupreanof Peninsula. The average animal catch weight from Stepovak Bay was 471 kg per haul, and from southwest

Kupreanof was 992 kg per haul (Table 7). While Stepovak Bay had a lower catch of Tanner crab (1.6 kg per haul) than southwest Kupreanof (2.5 kg per haul), it had a higher composition of Tanner crab in the catch (0.45% in Stepovak Bay vs. 0.36% southwest of Kupreanof Peninsula).

Standard Stepovak Bay stations had an average catch of 28 Tanner crab per haul, less than half the average catch of 70 crab per haul in the southwest Kupreanof stations (Table 8). The crab from Stepovak were larger than those caught southwest of Kupreanof Peninsula, averaging 43.5 mm CW for males (range 19–132 mm CW) and 45.1 mm CW for females (range 19–100 mm CW; Figure 16). There were few mature crab captured in either location (11 mature females and 2 mature males in Stepovak Bay; 2 mature females and 22 mature males southwest of Kupreanof Peninsula). There were no legal males captured in either location.

Stations southwest of Kupreanof Peninsula had a higher total Tanner crab density of 10,684 crab/nmi², compared to Stepovak Bay with a density of 4,278 crab/nmi², resulting in a higher Tanner crab abundance estimate for Kupreanof Peninsula stations (Table 10). The area considered when determining abundance for Kupreanof Peninsula stations (260.2 km²) was twice that of the area considered for the smaller Stepovak Bay stations (123.6 km²; Spalinger 2016).

Species composition southwest of Kupreanof Peninsula and in Stepovak Bay both had arrowtooth flounder and flathead sole as the top 2 species (Figure 13). However, stations southwest of Kupreanof Peninsula had a substantially higher proportion of arrowtooth flounder. The next most prevalent species were eulachon *Thaleichthys pacificus* and jellyfish Schyphozoa in the stations southwest of Kupreanof Peninsula and walleye pollock and Pacific halibut in Stepovak Bay. A total of 29 species were identified southwest of Kupreanof Peninsula and 39 species from Stepovak Bay.

2016 Trawl survey west of Cherni Island

West of Cherni Island, 7 hauls were completed on August 7, 2016 (Figure 5) in 5 stations. The total area used to determine Tanner crab abundance estimates in the area was 440.1 km². Hauls averaged 1.8 km long with an average depth of 64 fathoms.

Catch Composition

CPUE of all species from hauls west of Cherni Island in 2016 was 362 kg/km towed. Flathead sole was the dominant species caught by weight (33.9%) followed by arrowtooth flounder (24.6%; Figure 20). The average total animal weight per haul was 651 kg and the average Tanner crab weight per haul was 24.14 kg, making it 5th out of 53 species caught by weight and 3.6% of the overall catch (Table 11).

Tanner Crab

A total of 585 Tanner crab were captured west of Cherni Island in 2016, with catches ranging from 9 to 218 crab per haul (Table 12). Of the 207 females captured, 153 were mature, and of the 378 males captured, 114 were mature.

Average size of crab captured west of Cherni Island was 93.0 mm CW for males (range 10–172 mm CW) and 77.9 mm CW for females (range 25–110 CW; Figure 21). Over 80% of male crab less than 105 mm CW were in new or soft shell condition. Of male crab greater than 105 mm CW over 80% were in old or very old shell condition (Figure 22). Egg clutches of 153 mature female Tanner crab from west of Cherni Island were examined: 94.1% of mature females were in

old or very old shell condition (Figure 23) and 98.0% had an egg clutch that was more than half full.

Mature males were captured at 6 of 7 haul locations and legal males were found at 2 haul locations (Figure 24). Tanner crab abundance estimates were derived for each station and summed by area. When multiple hauls were conducted in a single station, catches from each haul were averaged before being expanded to station area for population calculation. Total abundance of Tanner crab west of Cherni Island was estimated at 1,742,525 crab (Table 13).

Comparison of Cherni Island Hauls to Sanak Island and Morzhovoi Bay Survey Hauls, 2016

As part of the standard 2016 trawl survey, 7 hauls were conducted north of Sanak Island and 13 hauls in Morzhovoi Bay. Summarized results from these areas were compared to results from 7 hauls in the nearby area west of Cherni Island. Average animal catch weight from Sanak Island was 197 kg per haul, Morzhovoi Bay was 1,276 kg per haul, and Cherni Island was 651 kg per haul. Sanak Island had the lowest average catch weight of Tanner crab (0.29 kg per haul) and the lowest percent of catch that was Tanner crab (0.16%), followed by Cherni Island (24.14 kg per haul of Tanner crab; 3.62% of catch). Morzhovoi Bay, which has the highest Tanner crab abundance in the South Peninsula District, averaged 116.97 kg per haul of Tanner crab and animal catch was composed of 5.69% Tanner crab (Table 11).

Stations west of Cherni Island had an average catch of 84 Tanner crab per haul, higher than the average of only 6 Tanner crab per haul from Sanak Island. Morzhovoi Bay had a higher number of Tanner crab per haul, averaging 287 crab (Table 12). The crab from Sanak in 2016 averaged 50.5 mm CW for males (range 24–88 mm CW) and 41.4 mm CW for females (range 18–83 mm CW). The crab from Cherni Island averaged 93.0 mm CW for males (range 10–172 mm CW) and 77.9 mm CW for females (range 25–110 mm CW). The crab from Morzhovoi Bay averaged 116.8 mm CW for males (range 10–162 mm CW) and 91.6 mm CW for females (range 20–109 mm CW; Figure 21).

Just over half of Tanner crab captured west of Cherni Island were juveniles (54.4%) with greater numbers of adults seen in the stations closest to Morzhovoi Bay. This proportion is in between what was captured around Sanak Island (97.8% juveniles) and Morzhovoi Bay (25.7% juveniles).

Tanner crab density in 2016 was highest in Morzhovoi Bay (45,388 crab/nmi²), compared to Cherni Island (13,068 crab/nmi²), and Sanak Island (1,243 crab/nmi²). Morzhovoi Bay had the highest Tanner crab abundance estimate, followed by Cherni Island and Sanak Island (Table 13). The area considered west of Cherni Island (440.1 km²) was approximately 1.2 times greater than the area considered for the 13 Morzhovoi Bay stations (377.6 km²). The area considered for the 7 Sanak Island stations (445.6 km²) was similar to the 5 stations west of Cherni Island.

Morzhovoi Bay had the highest legal male Tanner crab density (2,771 crab/nmi²), followed by Cherni Island (290 crab/nmi²). There were no legal Tanner crab captured at Sanak Island in 2016.

Species composition west of Cherni Island was similar to Sanak Island, with flathead sole, arrowtooth flounder, common mud star, and jellyfish present in the largest proportions (Figure 20). The next most prevalent species by weight in the Cherni Island area was Tanner crab, while at Sanak Island it was rex sole *Glyptocephalus zachirus*. Morzhovoi Bay also had the highest

proportions of flathead sole and arrowtooth flounder, but the next more prevalent species by weight were Tanner crab, Pacific halibut, and walleye pollock.

DISCUSSION

2013 Survey

Unimak Bight is a large area and 2013 test hauls only covered a small portion of the western side of the area. The purpose of conducting test hauls in Unimak Bight in 2013 was to obtain preliminary information on the Tanner crab population and investigate the possibility of adding additional trawl locations for the 2014 survey. Results showed that Tanner crab length frequency data from the 2013 survey in Unimak Bight and near Sanak Island both showed a peak in sizes at 25–29 mm CW, although the density of crab was much lower in Unimak Bight (Figure 7). The low densities of crab found in this area were unlike the remainder of the South Peninsula District and even though results did not show mature or legal crab available for commercial harvest, the area does support juvenile crab.

2014 Survey

Crab density in Unimak Bight in 2014 was also lower than densities in the remainder of the South Peninsula District. The survey indicated that the area can support juvenile Tanner crab, but the small number of legal males caught in 2014 would not support a fishery.

If the South Peninsula District had opened for commercial Tanner crab fishing in 2015 with the same criteria for establishing harvest levels as the remainder of the district (20% molting mature harvest rate and a precautionary halving measure in effect; 5AAC 35.507), the maximum amount of Tanner crab that ADF&G would consider for harvest would have been 4,250 pounds. Because of concerns for the existing crab population in the area it is unlikely the area would have been opened.

Unimak Bight had a greater number of species present (55 species) than either of the 2 closest areas, Sanak (39 species) or Morzhovoi (45 species). The size range and maturity of Tanner crab present indicated that it supports a small crab population. Based on comparisons of data collected in 2013 and 2014, Unimak Bight does not contain enough crab capable of supporting a commercial fishery.

2015 Survey

Cherni Island survey results demonstrated similarities between Sanak Island and Morzhovoi Bay, suggesting there may be some connectivity between those areas. At the low population levels seen in 2105, Tanner crab captured from Sanak and Morzhovoi fell into 2 distinctly different size groups (Figure 14). As population increases, crab may move from those areas mixing throughout the Cherni Island area.

Tanner crab catch from stations southwest of Kupreanof Peninsula most closely resembled the survey area closest to it, Stepovak Bay to the north. It had larger catch of juvenile crab, resulting in a higher overall density than Stepovak Bay. However, average crab size was smaller. The low numbers of mature and legal male crab captured make it unlikely that this area would contribute significantly to a fishery. Because of its distance offshore and high probability of inclement weather it may not be an efficient use of resources to survey this area regularly. Although this

area is near the Nagai Strait standard survey stations, characteristics of the captured crab were not similar.

The areas surveyed in 2015 showed densities of Tanner crab higher than found in Unimak Bight in 2014 and more comparable to standard survey areas, Cherni Island in particular. Although it had a lower total Tanner crab density it had a higher legal male density than Sanak Island. As a one-time survey addition, we are unable to make conclusions about population trends. If the Cherni Island area continues to show similarities in Tanner crab size frequency and abundance with both Morzhovoi and Sanak, it may be a reasonable alternative to Sanak Island stations if weather or budget constraints make it difficult to access Sanak.

2016 Survey

Similar to Tanner crab size frequency results from 2015, Cherni Island stations demonstrated characteristics of both Sanak Island and Morzhovoi Bay stations, indicating that there is likely some biological connectivity between those areas. Tanner crab populations in Sanak and Morzhovoi have declined since 2015, and crab captured in those two areas continue to demonstrate distinct size differences, with crab from each area represented at Cherni Island stations (Figure 21).

Based on results from 2016 Cherni Island hauls, the majority of mature crab are distributed in the more northerly stations, closer to Morzhovoi Bay with the exception of station 88, which did not have any mature crab. Hauls closer to Sanak Island and Cherni Island had higher proportions of small, juvenile crab.

Only 2 Cherni Island haul locations were sampled both in 2015 and 2016 (hauls 284 (2015) and 265 (2016) in station 112; hauls 285 (2015) and 263 (2016) in station 111). In both instances tows completed in 2016 captured more crab. Density in those 2 stations, and overall in the Cherni Island stations, increased from 2015, although additional stations were sampled in 2016.

Conversely, density in Sanak Island and Morzhovoi Bay stations declined during the same period. Based on 2015 and 2016 results, it seems likely that crab are moving in and out of the area between Morzhovoi Bay and Sanak Island and are parts of the same populations. This area has an irregular bottom, with limited trawlable area, and likely limited habitat for Tanner crab. This may cause patchy crab distribution, leading to an over or under estimation of crab abundance. If this area continued to be surveyed regularly, additional effort should be made to define crab habitat of the stations.

None of the previously unsurveyed areas explored from 2013–2015 showed a substantial surplus of legal male Tanner crab. In Unimak Bight there was no harvestable surplus in 2013, while the following year, in 2014, there was 4,250 pounds of surplus crab. In 2015, the legal male catch translated to a harvestable surplus of 5,200 pounds for the area between Sanak and Morzhovoi Bay. As more legal males were captured between Sanak and Morzhovoi Bay in 2016, if the South Peninsula District had opened to fishing in 2017, using the same criteria for establishing harvest levels as the rest of the district (30% legal male harvest rate), the area west of Cherni Island could have potentially contributed 28,700 pounds of Tanner crab to the fishery. However, ADF&G's concerns about opening a fishery when legal males are found only in discrete areas resulted in the continued closure of this area.

ACKNOWLEDGEMENTS

Funding to expand the survey was provided by the Aleutians East Borough under cooperative agreement 14-108. I would like to thank the skippers of the R/V *Resolution*, Denis Cox Jr. and Dan Wilson, vessel crew Kurt Pedersen, Gary Wilson, and Joy Brooks, sampling crew Collin Hakkinen, Sherry Barker, and David Gilliland, and cruise leaders Mark Stichert and Nathaniel Nichols for the extra time spent at sea, Richard Shepard (Analyst/Programmer) for his assistance with survey databases, and Mark Stichert along with Ernie Weiss from the Aleutians East Borough for forming the cooperative agreement.

REFERENCES CITED

- Alverson, D. L., and W. T. Pereyra. 1969. Demersal fish explorations in the northeastern Pacific Ocean—an evaluation of exploratory fishing methods and analytical approaches to stock size and yield forecasts. Journal of the Fisheries Research Board of Canada 26:1985-2001.
- Colgate, W. A. 1983. Westward Region Tanner crab, Chionoecetes bairdi, population index surveys. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Report to Industry, Kodiak.
- Spalinger, K. 2014. Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutians Management District, 2013. Alaska Department of Fish and Game, Fishery Management Report No. 14-34, Anchorage.
- Spalinger, K. 2015a. Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutians Management Districts, 2014. Alaska Department of Fish and Game, Fishery Management Report No. 15-27, Anchorage.
- Spalinger, K. 2015b. Operational plan: Large-mesh bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutian management districts—Standard protocol 2015-2019. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Operational Plan ROP.CF.4K.2015.20, Kodiak.
- Spalinger, K. 2016. Bottom trawl survey of crab and groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutians Management Districts, 2015. Alaska Department of Fish and Game, Fishery Management Report No. 16-20, Anchorage.
- Urban, D., and I. Vining. 1999. Reconstruction of historic abundances of Kodiak, Chignik, and South Peninsula Tanner crab, report to the Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K99-17, Kodiak.
- Urban, D., D. Pengilly, D. Jackson, and I. Vining. 1999. A Tanner crab harvest strategy for Kodiak, Chignik, and the South Peninsula Districts, report to the Board of Fisheries. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K99-21, Kodiak.

TABLES

Table 1.— Weight of catch in kilograms by haul from the exploratory survey area of Unimak Bight and the standard survey area of Sanak Island, 2013 trawl survey.

		Total animal	Total Tanner	
Station	Haul	weight	weight	% Tanner
Unimak Bight				
25	309	266	0.00	0.00%
25	310	212	0.11	0.05%
33	311	311	0.32	0.10%
Unimak Haul A	Average	263	0.14	0.05%
Sanak Island				
126	312	438	1.28	0.29%
125	313	415	3.14	0.76%
137	314	434	2.33	0.54%
138A	315	273	0.81	0.30%
138C	316	566	8.10	1.43%
138B	317	707	1.61	0.23%
113	318	477	2.36	0.49%
Sanak Haul Av	erage	473	2.80	0.59%

Table 2.– Number of male and female Tanner crab captured by haul from the exploratory survey area of Unimak Bight and the standard survey area of Sanak Island in 2013.

Station	Haul	Males	Females	Total
Unimak Bight				
25	309	0	0	0
25	310	9	10	19
33	311	10	18	28
Total		19	28	47
Unimak Haul A	Average	6	9	16
Sanak Island				
126	312	6	16	22
125	313	26	23	49
137	314	24	21	45
138A	315	33	34	67
138C	316	60	49	109
138B	317	20	14	34
113	318	36	37	73
Total		205	194	399
Sanak Haul Av	verage	29	28	57

Table 3.– Tanner crab abundance estimates by station from Unimak Bight and Sanak Island, 2013 trawl survey.

Station	Haul		Females		No. s	sublegal ma	les by size (C	CW)	Recruit	Postrecruit n	nales (CW)	Legal	Total	Total
	no.	Juvenile	Mature	Total	<70 mm	70–91 mm	92–114 mm	>114 mm	males	<165 mm	>165 mm	males	males	crab
Unimak	Bight													
25	310	19,603	0	19,603	17,642	0	0	0	0	0	0	0	17,642	37,245
33	311	70,570	0	70,570	39,205	0	0	0	0	0	0	0	39,205	109,775
Total		90,173	0	90,173	56,847	0	0	0	0	0	0	0	56,847	147,020
Sanak Isl	land													
113	318	149,527	8,544	158,071	136,710	17,089	0	0	0	0	0	0	153,799	311,870
125	313	98,260	0	98,260	98,260	4,272	0	4,272	0	4,272	0	4,272	111,077	209,337
126	312	74,279	0	74,279	23,212	0	0	0	0	4,642	0	4,642	27,855	102,134
137	314	94,938	4,747	99,684	99,684	0	9,494	0	0	4,747	0	4,747	113,925	213,609
138A	315	87,153	0	87,153	84,589	0	0	0	0	0	0	0	84,589	171,742
138B	317	13,255	1,020	14,275	19,373	0	0	1,020	0	0	0	0	20,393	34,667
138C	316	151,292	3,152	154,444	160,748	6,304	3,152	9,456	0	9,456	0	9,456	189,116	343,560
Total		668,704	17,463	686,166	622,576	27,665	12,646	14,748	0	23,117	0	23,117	700,754	1,386,919

Table 4.— Weight of catch in kilograms by haul from the exploratory survey area of Unimak Bight and the standard survey area of Sanak Island, 2014 trawl survey.

		Total animal	Total Tanner	
Station	Haul	weight	weight	% Tanner
Unimak Bight				
OTC	249	1,443	0.71	0.05%
71	250	1,077	0.01	0.00%
56	251	351	0.29	0.08%
48	252	1,290	0.00	0.00%
32	253	630	0.01	0.00%
33	254	399	2.65	0.66%
64	255	618	1.77	0.29%
57	256	290	1.71	0.59%
58	257	742	0.27	0.04%
49	258	598	0.47	0.08%
41	259	311	0.04	0.01%
Unimak Haul A	verage	704	0.72	0.16%
Sanak Island				
113	219	594	4.87	0.82%
125	220	272	0.31	0.11%
126	221	432	4.17	0.97%
138A	222	425	22.02	5.18%
138C	223	327	35.56	10.87%
138B	224	348	6.86	1.97%
137	225	519	1.15	0.22%
Sanak Haul Av	rerage	417	10.71	2.88%

Table 5.— Number of male and female Tanner crab captured by haul from the exploratory survey area of Unimak Bight and the standard survey area of Sanak Island in 2014.

Station	Haul	Males	Females	Total
Unimak Bight				
OTC	249	2	1	3
71	250	0	2	2
56	251	1	1	2
48	252	0	0	0
32	253	1	0	1
33	254	4	3	7
64	255	7	4	11
57	256	3	4	7
58	257	2	4	6
49	258	8	12	20
41	259	1	3	4
Total		29	34	63
Unimak Haul A	Average	3	3	6
Sanak Island				
113	219	36	27	63
125	220	0	0	0
126	221	7	2	9
138A	222	6	19	25
138C	223	24	28	52
138B	224	59	8	67
137	225	110	85	195
Total		242	169	411
Sanak Haul A	verage	35	24	59

Table 6.– Tanner crab abundance estimates by station from Unimak Bight and Sanak Island, 2014 trawl survey.

Station	Haul		Females		No. s	sublegal ma	les by size (C	W)	Recruit	Postrecruit r	nales (CW)	Legal	Total	Total
	no.	Juvenile	Mature	Total	<70 mm ′	70–91 mm	92–114 mm	>114 mm	males	<165 mm	>165 mm	males	males	crab
Unimak	Bight													
OTC	249	0	726	726	0	726	726	0	0	0	0	0	1,452	2,178
71	250	9,691	0	9,691	0	0	0	0	0	0	0	0	0	9,691
56	251	0	4,891	4,891	0	4,891	0	0	0	0	0	0	4,891	9,782
48	252	0	0	0	0	0	0	0	0	0	0	0	0	0
32	253	0	0	0	3,913	0	0	0	0	0	0	0	3,913	3,913
33	254	14,702	0	14,702	9,801	0	0	0	0	9,801	0	9,801	19,603	34,305
58	257	11,784	3,928	15,713	7,856	0	0	0	0	0	0	0	7,856	23,569
64	255	11,739	3,913	15,652	19,565	0	3,913	0	0	3,913	0	3,913	27,391	43,042
57	256	7,841	7,841	15,682	0	3,921	3,921	3,921	0	0	0	0	11,762	27,444
49	258	53,907	4,901	58,808	34,305	4,901	0	0	0	0	0	0	39,205	98,013
41	259	11,762	0	11,762	3,921	0	0	0	0	0	0	0	3,921	15,682
Total		121,427	26,200	147,627	79,361	14,438	8,560	3,921	0	13,714	0	13,714	119,993	267,620
Sanak Is	land													
113	219	111,077	4,272	115,349	140,982	4,272	0	4,272	0	4,272	0	4,272	153,799	269,148
125	220	0	0	0	0	0	0	0	0	0	0	0	0	0
126	221	0	9,285	9,285	13,927	4,642	0	4,642	0	9,285	0	9,285	32,497	41,782
137	225	64,558	7,595	72,153	22,785	0	0	0	0	0	0	0	22,785	94,938
138A	224	51,266	20,507	71,773	41,013	7,690	7,690	2,563	0	2,563	0	2,563	61,520	133,292
138B	222	6,118	2,039	8,157	30,589	7,137	6,118	7,137	0	9,177	0	9,177	60,158	68,315
138C	223	226,939	40,975	267,914	245,850	15,760	12,608	28,367	0	37,823	6,304	44,127	346,712	614,625
Total		459,958	84,673	544,631	495,146	39,501	26,416	46,981	0	63,120	6,304	69,424	677,471	1,222,100

Table 7.— Weight of catch in kilograms by haul from the exploratory survey areas of Cherni Island and southwest Kupreanof Peninsula and the standard survey areas of Sanak Island, Morzhovoi Bay, and Stepovak Bays, 2015 trawl survey.

		Total animal	Total Tanner	
Station	Haul	weight	weight	% Tanner
Cherni Island				
124	283	614	0.21	0.03%
112	284	985	4.29	0.44%
111	285	1,291	8.56	0.66%
Cherni Haul Av	verage	963	4.35	0.38%
Sanak Island				
113	276	84	1.88	2.24%
125	277	169	0.34	0.20%
137	278	483	1.42	0.29%
126	279	141	1.85	1.31%
138B	280	551	2.86	0.52%
138C	281	470	1.19	0.25%
138A	282	479	1.00	0.21%
Sanak Haul Av		340	1.51	0.72%
Morzhovoi Bay				
MORX	286	1,099	6.71	0.61%
MOSX	287	1,370	20.34	1.48%
87AX	288	1,947	484.01	24.86%
87D	289	1,190	18.86	1.58%
MOOX	290	3,086	823.20	26.68%
MOK	291	2,621	61.11	2.33%
MOL	292	1,867	88.93	4.76%
MOH	293	805	30.68	3.81%
MOB	294	1,056	1.07	0.10%
MOD	295	1,412	21.01	1.49%
MOF	296	1,753	5.93	0.34%
MOG	297	1,438	301.01	20.93%
MOI	298	903	166.04	18.39%
Morzhovoi Hau	ıl Average	1,581	156.07	8.26%
Kupreanof Peni	•	·		
391	315	468	3.49	0.75%
411	316	944	1.78	0.19%
410	317	1,565	2.11	0.13%
Kupreanof Hau		992	2.46	0.36%
Stepovak Bay	ar r r v r u g v			0.0070
STD	196	380	1.35	0.36%
STA	197	641	1.52	0.24%
STB	198	502	0.45	0.09%
STE	199	35	0.35	1.00%
368A	200	796	4.44	0.56%
Stepovak Haul		471	1.62	0.45%

Table 8.— Number of male and female Tanner crab captured by haul from the exploratory survey areas of Cherni Island and southwest Kupreanof Peninsula and from the standard survey areas of Sanak Island, Morzhovoi Bay and Stepovak Bay, 2015 trawl survey.

Station Haul	Males	Females	Total
Cherni Island			_
124 283	10	3	13
112 284	14	11	25
111 285	35	28	63
Total	59	42	101
Cherni Haul Average	20	14	34
Sanak Island			
113 276	24	24	48
125 277	15	25	40
137 278	42	48	90
126 279	37	17	54
138B 280	11	10	21
138C 281	10	3	13
138A 282	25	22	47
Total	164	149	313
Sanak Haul Average	23	21	45
Morzhovoi Bay			
MORX 286	14	6	20
MOSX 287	39	6	45
87AX 288	839	309	1,148
87D 289	46	22	68
MOOX 290	1,582	1,000	2,582
MOK 291	138	46	184
MOL 292	294	49	343
MOH 293	89	53	142
MOB 294	5	0	5
MOD 295	68	34	102
MOF 296	11	4	15
MOG 297	1,255	799	2,054
MOI 298	652	150	802
Total	5,032	2,478	
	3,032	2,478 191	7,510 578
Morzhovoi Haul Average	387	191	310
Kupreanof Peninsula	4.4	16	60
391 315	44	16	60
411 316	28	14	42
410 317	54	55	109
Total	126	85	211
Kupreanof Haul Average	42	28	70
Stepovak Bay		4.0	~ 0
STD 196	35	18	53
STA 197	15	17	32
STB 198	6	8	14
STE 199	1	0	1
368A 200	18	20	38
Total	75	63	138
Stepovak Haul Average	15	13	28

Table 9.– Tanner crab abundance estimates by station from Cherni and Sanak islands and Morzhovoi Bay, 2015 trawl survey.

Station	Haul	Haul Females			No	. sublegal m	ales by size (C	CW)	Recruit Postrecruit males (CW)			Legal	Total	Total
	no.	Juvenile	Mature	Total	<70 mm	70–91 mm	92–114 mm	>114 mm	males	<165 mm	>165 mm	males	males	crab
Cherni Is	land													
111	285	77,925	31,170	109,095	46,755	62,340	19,481	3,896	0	3,896	0	3,896	136,368	245,463
112	284	34,701	13,013	47,713	17,350	13,013	26,026	0	4,338	0	0	4,338	60,726	108,440
124	283	11,689	0	11,689	35,066	3,896	0	0	0	0	0	0	38,962	50,651
Total		124,315	44,183	168,497	99,171	79,249	45,507	3,896	4,338	3,896	0	8,234	236,056	404,554
Sanak Isl	and													
113	276	112,298	4,883	117,180	83,003	24,413	9,765	0	0	0	0	0	117,180	234,360
125	277	106,805	0	106,805	64,083	0	0	0	0	0	0	0	64,083	170,888
126	279	63,137	0	63,137	115,133	14,856	7,428	0	0	0	0	0	137,416	200,554
137	278	202,533	0	202,533	168,778	4,219	4,219	0	0	0	0	0	177,217	379,750
138A	282	45,114	0	45,114	43,064	6,152	2,051	0	0	0	0	0	51,266	96,381
138B	280	8,157	0	8,157	5,710	0	816	1,631	0	816	0	816	8,973	17,130
138C	281	7,565	0	7,565	10,086	10,086	5,043	0	0	0	0	0	25,215	32,780
Total		545,609	4,883	550,491	489,857	59,726	29,322	1,631	0	816	0	816	581,350	1,131,843
Morzhov	oi Bay													
87AX	288	40,866	545,848	586,714	39,826	246,923	780,595	422,159	71,687	31,861	0	103,548	1,593,051	2,179,765
87D	289	14,810	6,911	21,722	12,836	18,760	3,949	7,899	0	1,975	0	1,975	45,418	67,140
MOB	294	0	0	0	5,034	0	0	0	0	1,259	0	1,259	6,293	6,293
MOD	295	24,274	0	24,274	19,276	9,995	11,423	5,711	0	2,142	0	2,142	48,547	72,821
MOF	296	3,798	0	3,798	0	0	5,696	2,848	0	1,899	0	1,899	10,443	14,241
MOG	297	751,077	7,473	758,551	112,069	931,938	147,459	0	0	0	0	0	1,191,466	1,950,016
MOH	293	37,960	1,489	39,448	2,233	29,028	29,772	4,466	744	0	0	744	66,244	105,692
MOI	298	127,216	15,190	142,406	9,239	366,468	212,490	9,239	0	21,557	0	21,557	618,992	761,399
MOK	291	21,836	18,988	40,823	949	31,329	72,153	20,886	949	4,747	0	5,696	131,014	171,837
MOL	292	35,127	11,393	46,519	20,423	81,693	147,047	27,231	1,362	1,362	0	2,723	279,116	325,636
MOOX	290	580,398	1,903,167	2,483,565	0	665,227	2,328,296	769,169	83,153	83,153	0	166,307	3,929,000	6,412,565
MORX	286	15,585	0	15,585	7,792	5,195	2,597	10,390	7,792	2,597	0	10,390	36,365	51,950
MOSX	287	8,355	1,671	10,025	0	16,709	13,367	28,405	6,684	0	0	6,684	65,165	75,191
Total		1,661,302	2,512,130	4,173,430	229,677	2,403,265	3,754,844	1,308,403	172,371	152,552	0	324,924	8,021,114	12,194,546

Table 10.- Tanner crab abundance estimates by station from Kupreanof Peninsula and Stepovak Bay, 2015 trawl survey.

Station	Haul	Females			No	No. sublegal males by size (CW) Recr			Recruit	Recruit Postrecruit males (CW)			Total	Total Total
	no.	Juvenile	Mature	Total	<70 mm	70–91 mm	92–114 mm	>114 mm	males	<165 mm	>165 mm	males	males	crab
Kuprean	of Penins	ula												
410	317	208,264	3,857	212,121	200,551	0	7,713	0	0	0	0	0	208,264	420,385
411	316	53,548	0	53,548	87,971	11,475	0	7,650	0	0	0	0	107,096	160,643
391	315	57,600	3,840	61,441	122,881	38,400	7,680	0	0	0	0	0	168,961	230,402
Total		319,412	7,697	327,110	411,403	49,875	15,393	7,650	0	0	0	0	484,321	811,430
Stepovak	Bay													
368A	200	18,114	22,139	40,253	20,127	6,038	8,051	2,013	0	0	0	0	36,228	76,482
STA	197	15,804	0	15,804	12,085	930	0	930	0	0	0	0	13,944	29,748
STB	198	7,426	0	7,426	4,641	928	0	0	0	0	0	0	5,570	12,996
STD	196	18,128	0	18,128	33,234	2,014	0	0	0	0	0	0	35,248	53,376
STE	199	0	0	0	0	0	688	0	0	0	0	0	688	688
Total		59,472	22,139	81,611	70,087	9,910	8,739	2,943	0	0	0	0	91,678	173,290

Table 11.— Weight of catch in kilograms by haul from the exploratory survey area of Cherni Island and the standard survey areas of Sanak Island and Morzhovoi Bay, 2016 trawl survey.

		Total animal	Total Tanner	
Station	Haul	weight	weight	% Tanner
Cherni Island				
88	260	998	0.63	0.06%
111	261	459	41.36	9.01%
99	262	849	87.47	10.30%
111	263	771	29.30	3.80%
123	264	527	3.39	0.64%
112	265	723	4.96	0.69%
112	266	231	1.85	0.80%
Cherni Haul Avera	age	651	24.14	3.62%
Sanak Island				
113	232	188	0.66	0.35%
125	233	142	0.10	0.07%
126	234	214	0.09	0.04%
138B	235	324	0.03	0.01%
138C	236	186	0.35	0.19%
138A	237	145	0.29	0.20%
137	238	183	0.50	0.27%
Sanak Haul Avera	ge	197	0.29	0.16%
Morzhovoi Bay				
87D	267	845	19.88	2.35%
87AX	268	1,182	207.59	17.56%
MOOX	269	2,573	1,183.83	46.01%
MORX	270	1,485	2.12	0.14%
MOSX	271	808	0.28	0.03%
MOK	272	1,176	0.14	0.01%
MOL	273	1,844	21.28	1.15%
MOI	274	1,191	1.11	0.09%
MOH	275	926	36.69	3.96%
MOB	276	707	0.06	0.01%
MOD	277	1,144	4.50	0.39%
MOF	278	1,969	41.93	2.13%
MOG	279	739	1.14	0.15%
Morzhovoi Haul A	verage	1,276	116.97	5.69%

Table 12.— Number of male and female Tanner crab captured by haul caught from the exploratory survey area of Cherni Island and from the standard survey areas of Sanak Island and Morzhovoi Bay, 2016 trawl survey.

Station	Haul	Males	Females	Total
Cherni Island				
88	260	7	2	9
111	261	126	5	131
99	262	119	99	218
111	263	36	60	96
123	264	43	24	67
112	265	37	10	47
112	266	10	7	17
Total		378	207	585
Cherni Haul Ave	rage	54	30	84
Sanak Island				
113	232	7	4	11
125	233	2	2	4
126	234	2	2	4
138B	235	1	0	1
138C	236	6	1	7
138A	237	6	5	11
137	238	4	3	7
Total		28	17	45
Sanak Haul Aver	age	4	2	6
Morzhovoi Bay				
87D	267	38	12	50
87AX	268	353	30	383
MOOX	269	1,565	1,298	2,863
MORX	270	12	7	19
MOSX	271	10	6	16
MOK	272	3	5	8
MOL	273	46	5	51
MOI	274	6	3	9
MOH	275	97	30	127
MOB	276	0	4	4
MOD	277	19	10	29
MOF	278	149	17	166
MOG	279	5	5	10
Total		2,303	1,432	3,735
Morzhovoi Haul	Average	177	110	287

Table 13.– Tanner crab abundance estimates by station from Cherni and Sanak islands and Morzhovoi Bay, 2016 trawl survey.

Station	Haul		Females		No	o. sublegal m	ales by size (CW)	Recruit	ecruit Postrecruit males (CW)			Total	Total
	no.	Juvenile	Mature	Total	<70 mm	70–91 mm	92–114 mm	>114 mm	males	<165 mm	>165 mm	males	males	crab
Cherni Is	land													
111	261	9,741	0	9,741	17,533	56,495	116,887	54,547	0	0	0	0	245,463	255,203
111	263	13,637	103,250	116,887	15,585	1,948	25,326	21,429	0	3,896	1,948	5,844	70,132	187,019
112	265	21,688	0	21,688	43,376	23,857	10,844	2,169	0	0	0	0	80,245	101,933
112	266	13,663	0	13,663	9,760	1,952	3,904	3,904	0	0	0	0	19,519	33,183
123	264	89,613	3,896	93,510	151,953	0	11,689	3,896	0	0	0	0	167,538	261,048
88	260	8,490	0	8,490	21,224	4,245	4,245	0	0	0	0	0	29,713	38,203
99	262	0	393,246	393,246	3,972	7,944	190,665	230,387	0	39,722	0	39,722	472,690	865,936
Total		156,832	500,392	657,225	263,403	96,441	363,560	316,332	0	43,618	1,948	45,566	1,085,300	1,742,525
Sanak Isl	and													
113	232	19,530	0	19,530	19,530	14,648	0	0	0	0	0	0	34,178	53,708
125	233	8,544	0	8,544	8,544	0	0	0	0	0	0	0	8,544	17,089
126	234	9,285	0	9,285	9,285	0	0	0	0	0	0	0	9,285	18,570
137	238	9,494	4,747	14,241	14,241	4,747	0	0	0	0	0	0	18,988	33,228
138A	237	12,817	0	12,817	15,380	0	0	0	0	0	0	0	15,380	28,196
138B	235	0	0	0	1,020	0	0	0	0	0	0	0	1,020	1,020
138C	236	3,152	0	3,152	15,760	3,152	0	0	0	0	0	0	18,912	22,063
Total		62,822	4,747	67,569	83,760	22,547	0	0	0	0	0	0	106,307	173,874
Morzhov	oi Bay													
87AX	268	7,595	49,368	56,963	5,753	5,753	198,489	411,361	43,150	5,753	0	48,903	670,259	727,221
87D	267	987	10,861	11,848	0	2,962	22,709	9,874	987	987	0	1,975	37,519	49,368
MOB	276	5,873	0	5,873	0	0	0	0	0	0	0	0	0	5,873
MOD	277	7,139	0	7,139	6,425	1,428	3,570	2,142	0	0	0	0	13,565	20,704
MOF	278	12,342	3,798	16,139	2,848	57,912	72,153	8,544	0	0	0	0	141,457	157,596
MOG	279	4,747	0	4,747	1,899	949	1,899	0	0	0	0	0	4,747	9,494
MOH	275	14,142	8,187	22,329	10,420	1,489	43,914	16,375	0	0	0	0	72,198	94,527
MOI	274	1,899	949	2,848	3,798	949	949	0	0	0	0	0	5,696	8,544
MOK	272	4,747	0	4,747	2,848	0	0	0	0	0	0	0	2,848	7,595
MOL	273	1,899	2,848	4,747	1,899	0	17,089	24,684	0	0	0	0	43,671	48,418
MOOX	269	31,298	3,192,370	3,223,667	0	57,440	1,053,068	2,278,457	76,587	421,227	0	497,814	3,886,779	7,110,447
MORX	270	18,182	0	18,182	12,987	7,792	10,390	0	0	0	0	0	31,170	49,352
MOSX	271	11,139	0	11,139	16,709	1,857	0	0	0	0	0	0	18,566	29,705
Total		121,989	3,268,381	3,390,368	65,586	138,531	1,424,230	2,751,437	120,724	427,967	0	548,692	4,928,475	8,318,844

FIGURES

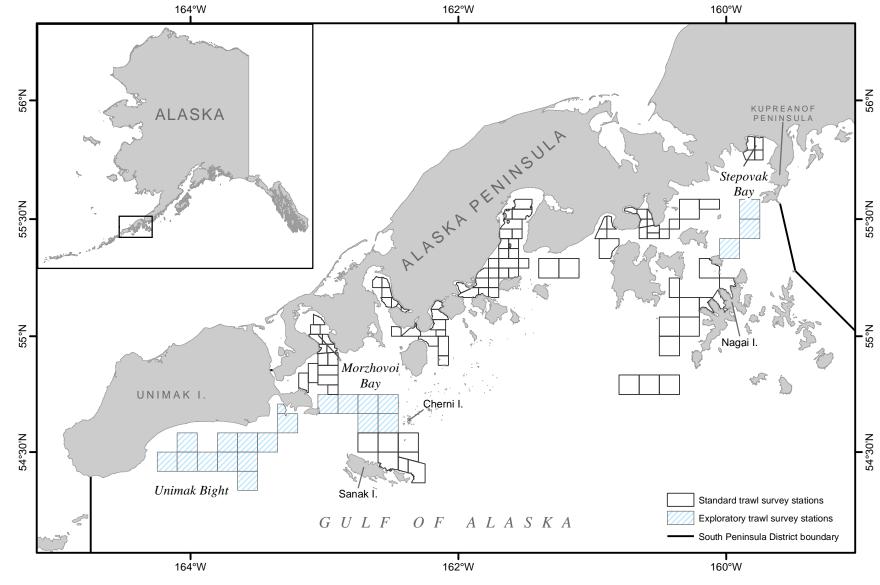


Figure 1.— Map of the South Peninsula District showing standard and exploratory survey stations.

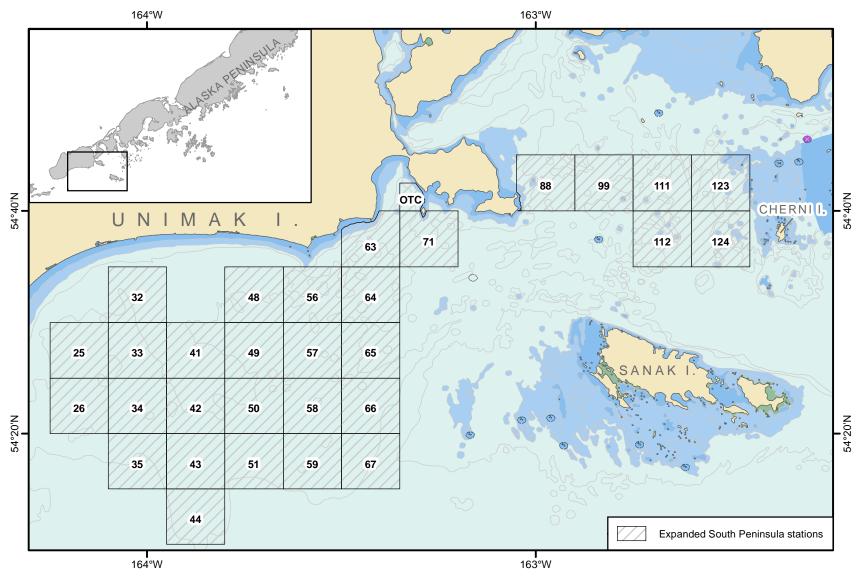


Figure 2.– South Peninsula District exploratory trawl survey grid showing stations in Unimak Bight and west of Cherni Island.

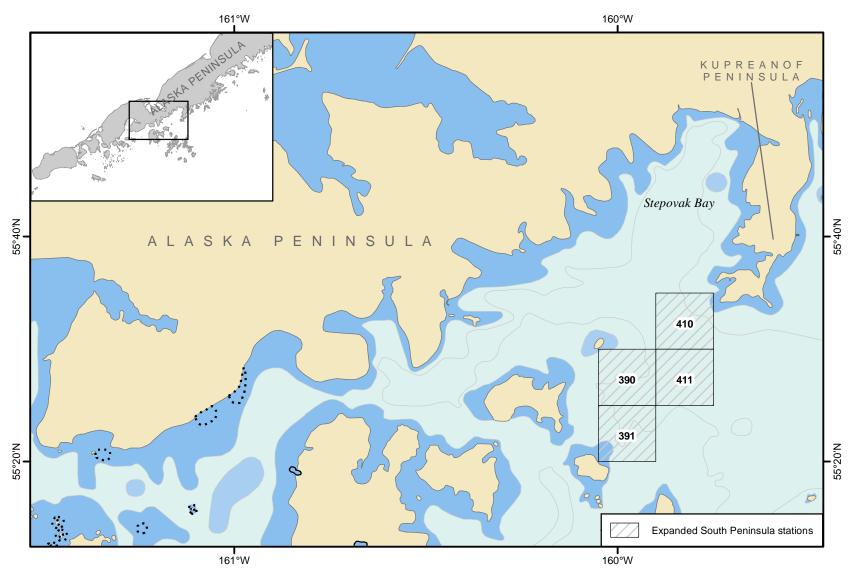


Figure 3.– South Peninsula District exploratory trawl survey grid showing stations southwest of Kupreanof Peninsula.

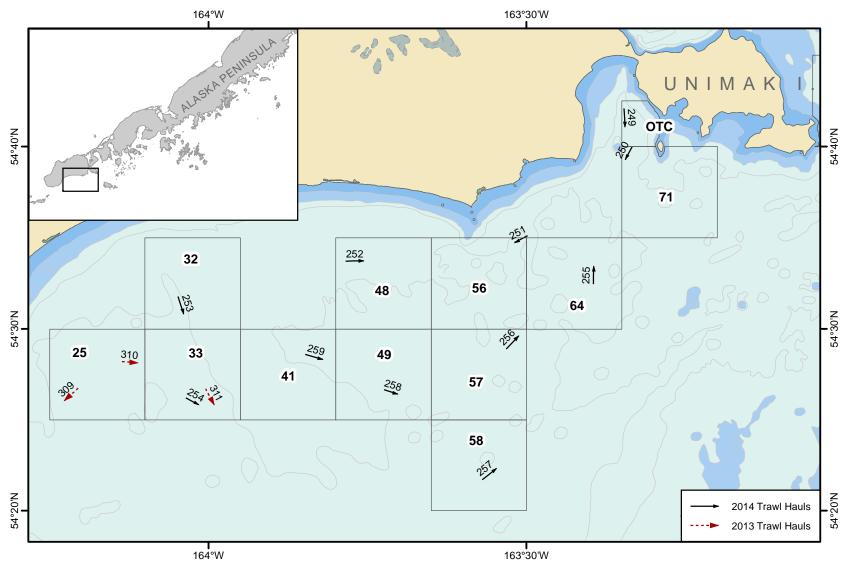


Figure 4.– Unimak Bight exploratory station haul locations in 2013 and 2014, including haul numbers.

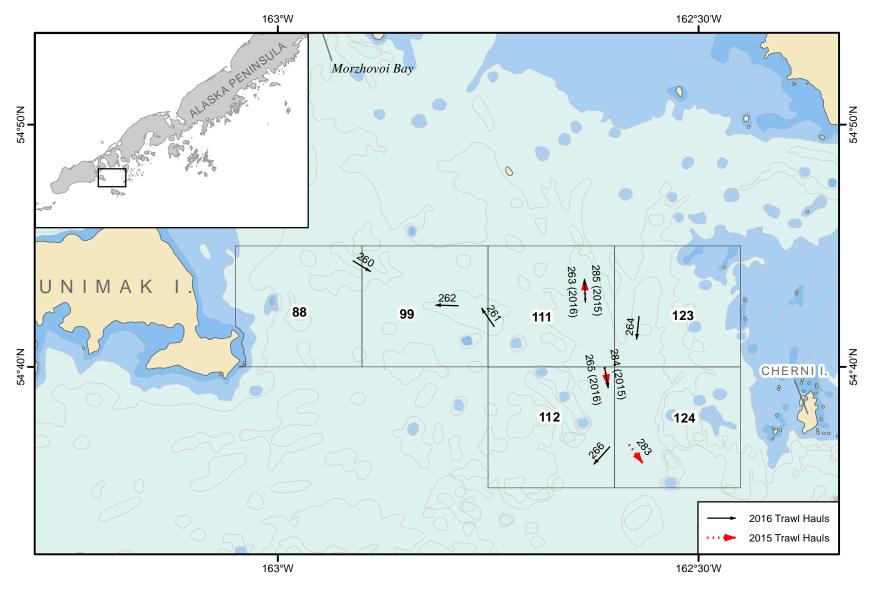


Figure 5.– Cherni Island exploratory station haul locations in 2015 and 2016, including haul numbers.

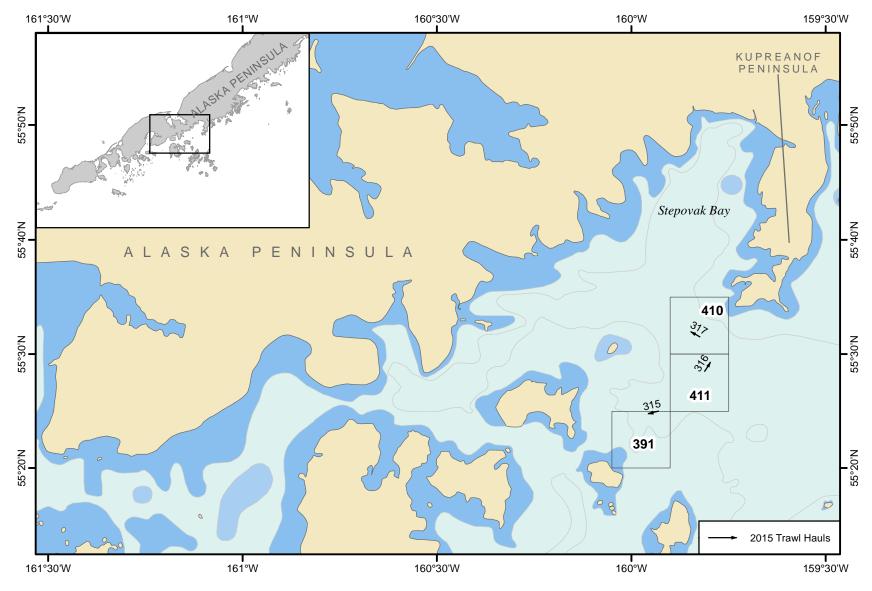


Figure 6.– Southwest Kupreanof Peninsula exploratory station haul locations in 2015, including haul numbers.

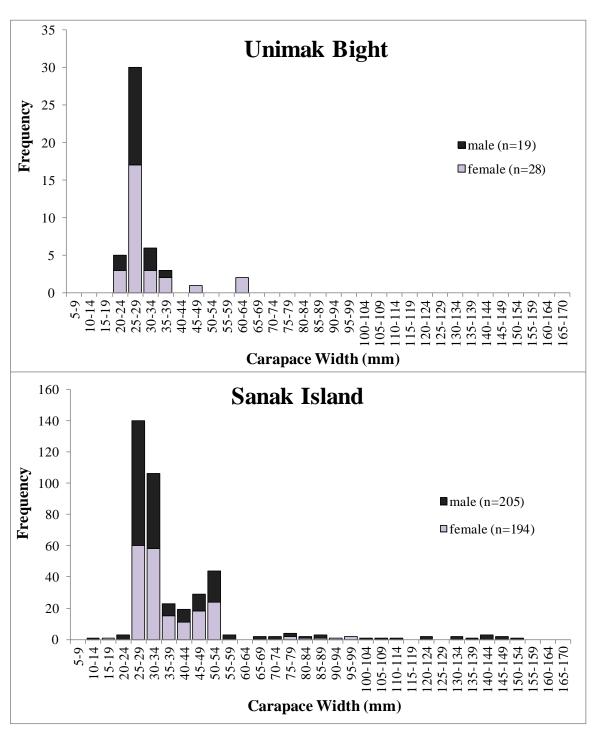


Figure 7.– Tanner crab male and female carapace width frequencies from Unimak Bight and Sanak Island, 2013 trawl surveys.

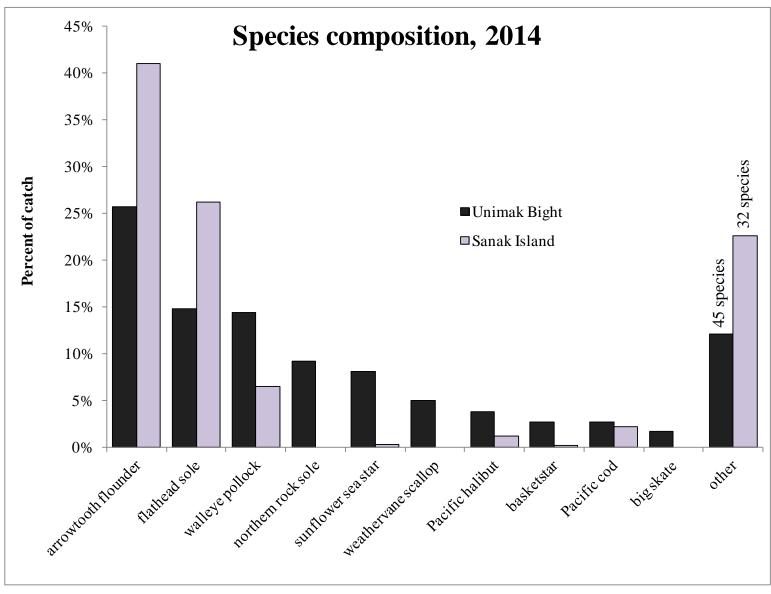


Figure 8.– Top ten species by weight from trawl survey hauls in Unimak Bight and Sanak Island, 2014.

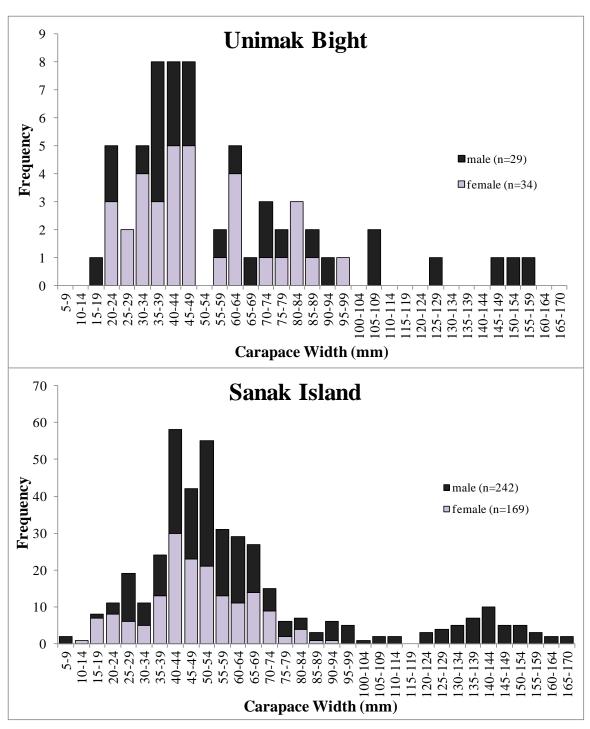


Figure 9.– Tanner crab male and female carapace width frequencies from Unimak Bight and Sanak Island, 2014 trawl surveys.

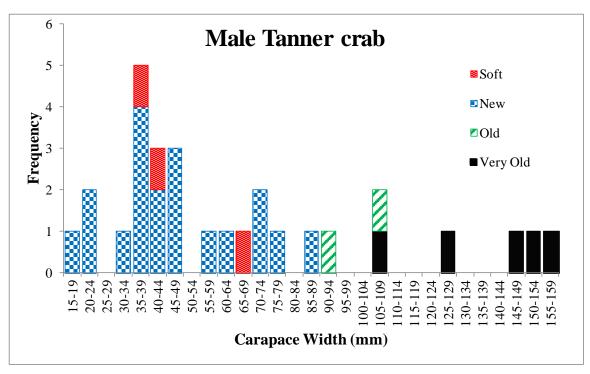


Figure 10.- Size frequency of male Tanner crab in Unimak Bight by shell condition, 2014.

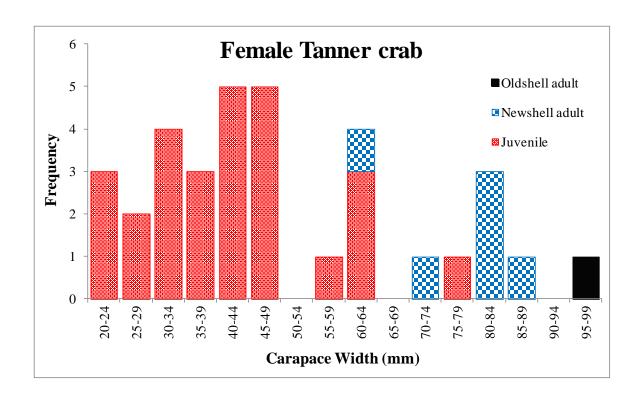


Figure 11.- Size frequency of juvenile and mature female Tanner crab in Unimak Bight, 2014.

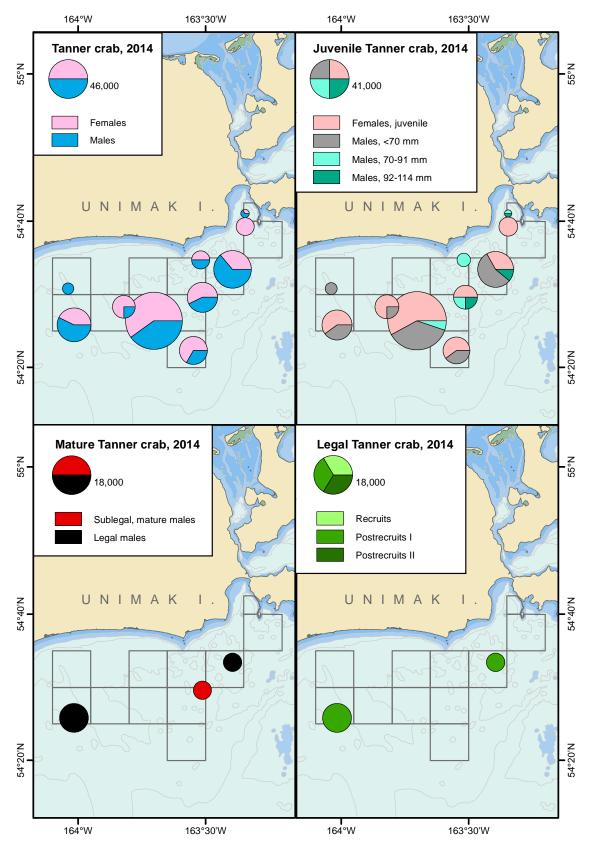


Figure 12.– Total abundance estimates of Tanner crab in Unimak Bight, 2014.

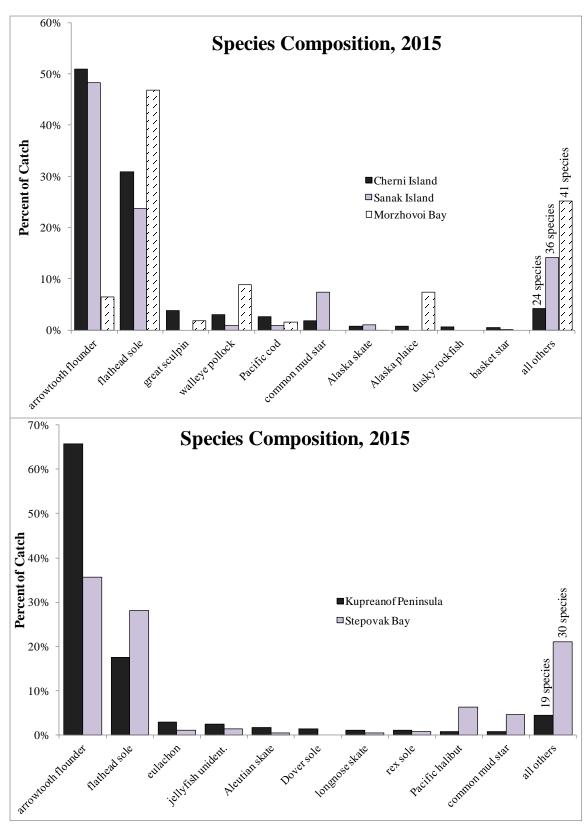


Figure 13.– Top ten species by weight from trawl survey hauls at Cherni and Sanak islands, Morzhovoi and Stepovak bays, and Kupreanof Peninsula, 2015.

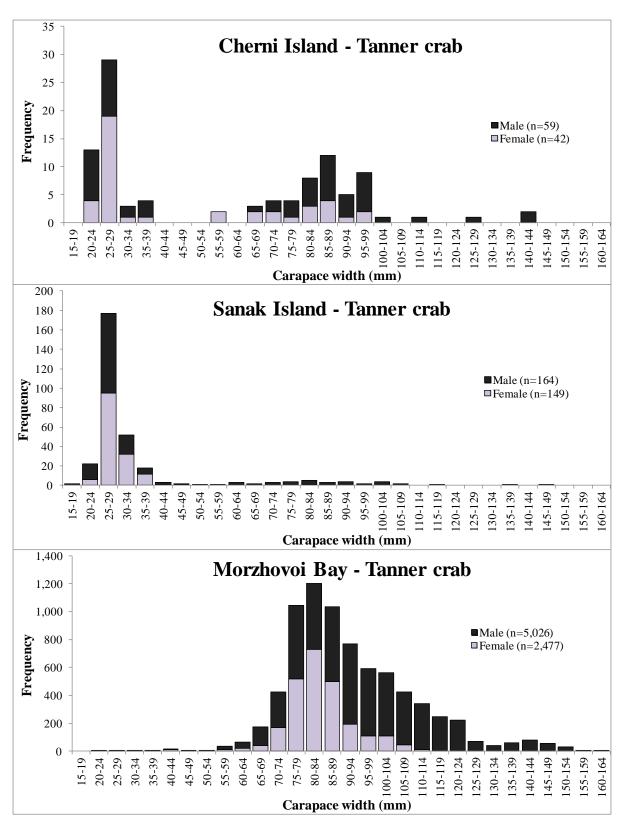


Figure 14.– Tanner crab male and female carapace width frequencies from Cherni Island, Sanak Island, and Morzhovoi Bay, 2015 trawl surveys.

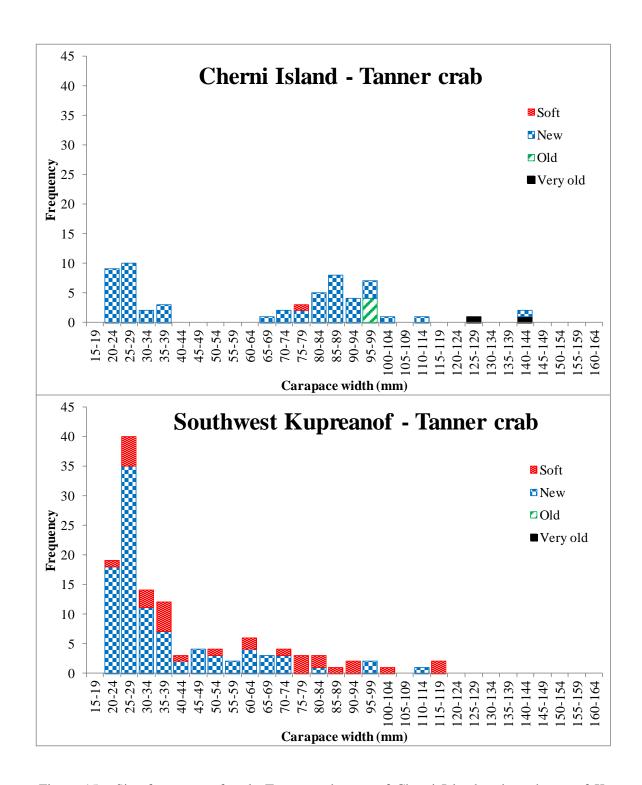


Figure 15.– Size frequency of male Tanner crab west of Cherni Island and southwest of Kupreanof Peninsula by shell condition, 2015.

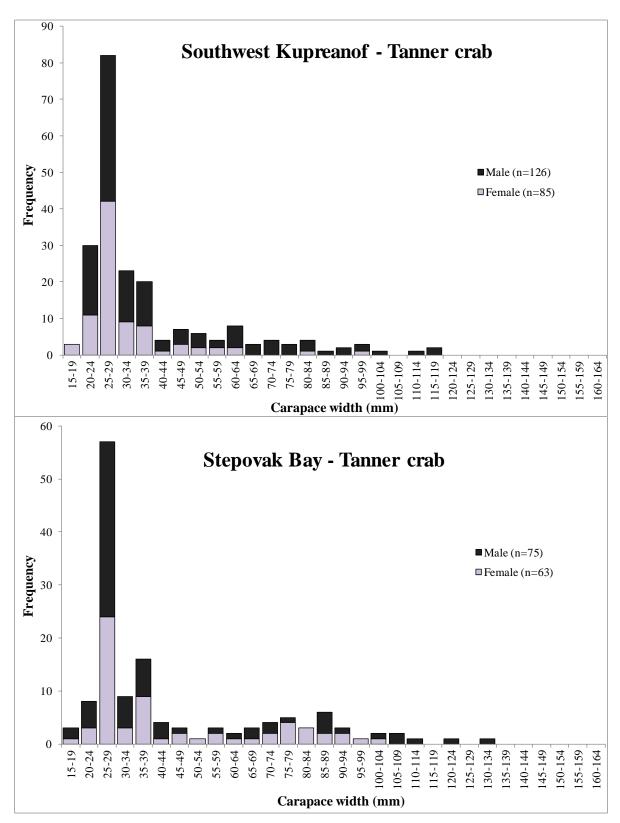


Figure 16.— Tanner crab male and female carapace width frequencies from southwest Kupreanof and Stepovak Bay, 2015 trawl surveys.

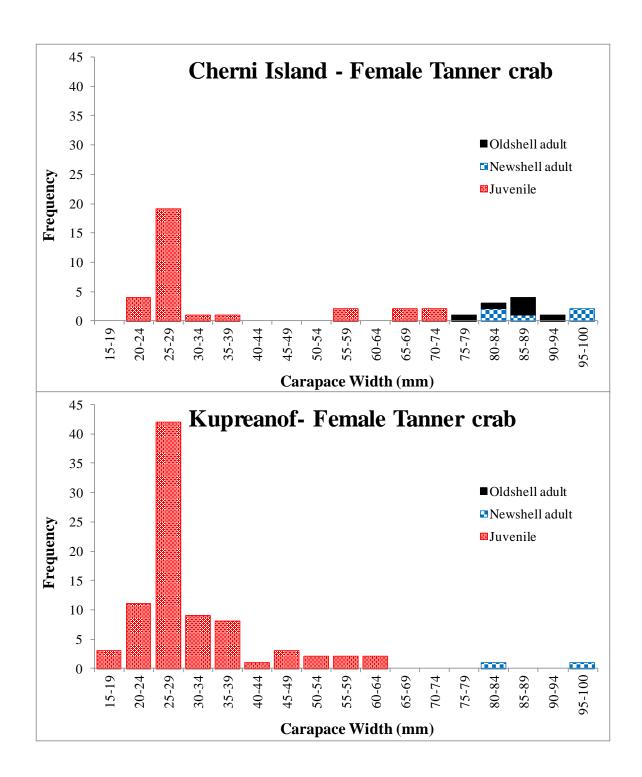


Figure 17.– Size frequency of juvenile and mature female Tanner crab west of Cherni Island and southwest of Kupreanof Peninsula, 2015.

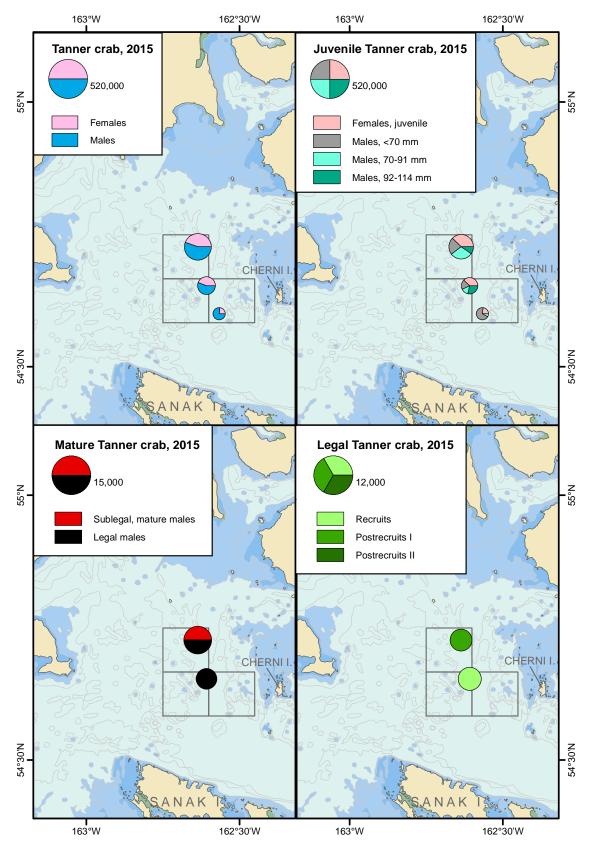


Figure 18.– Total abundance estimates of Tanner crab west of Cherni Island, 2015.

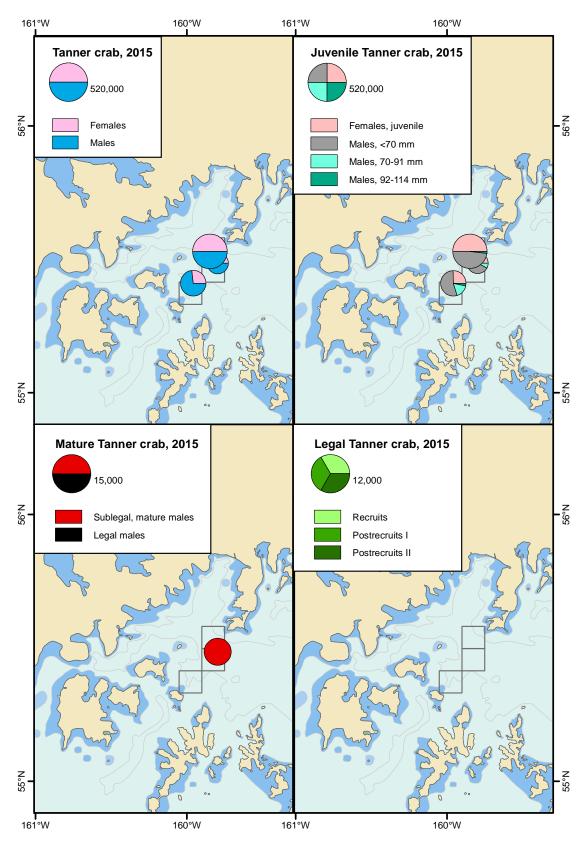


Figure 19.– Total abundance estimates of Tanner crab southwest of Kupreanof Peninsula, 2015.

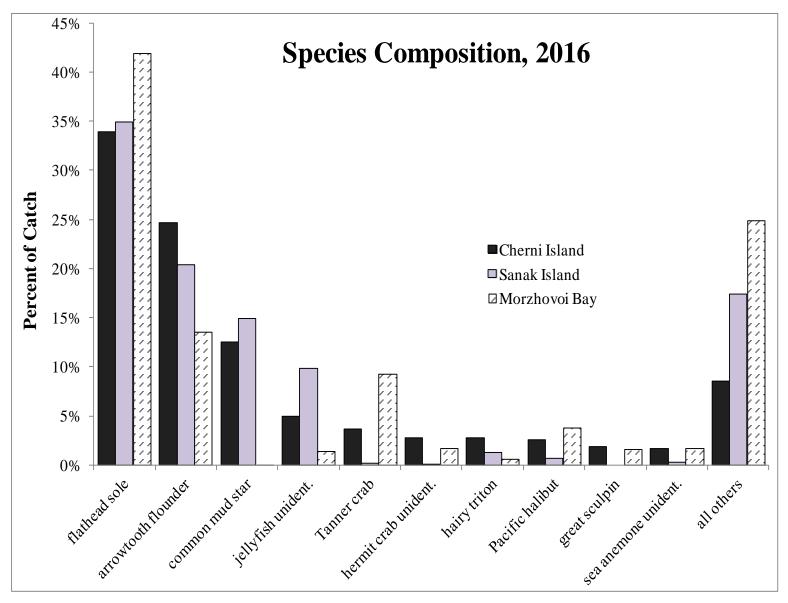


Figure 20.– Top ten species by weight from trawl survey hauls at Cherni and Sanak islands and Morzhovoi Bay, 2016.

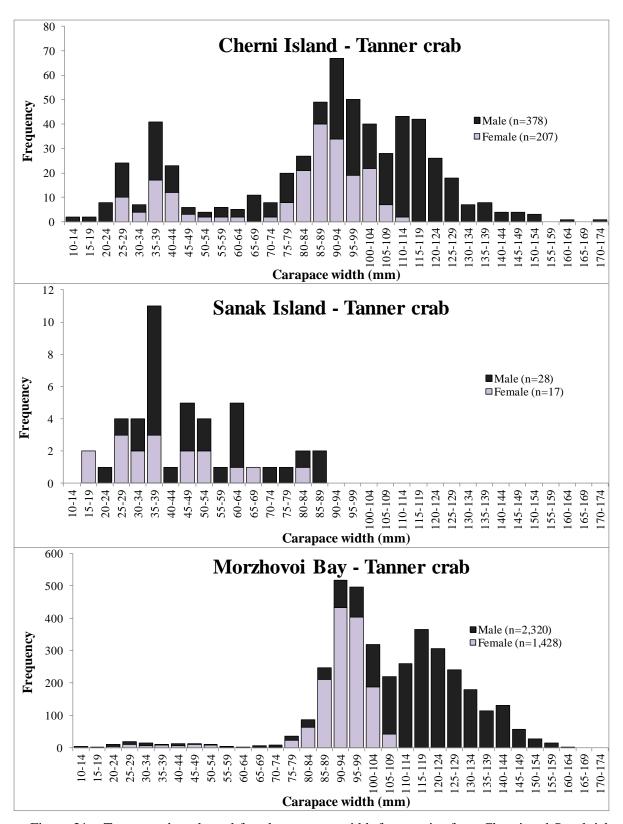


Figure 21.– Tanner crab male and female carapace width frequencies from Cherni and Sanak islands and Morzhovoi Bay, 2016 trawl survey.

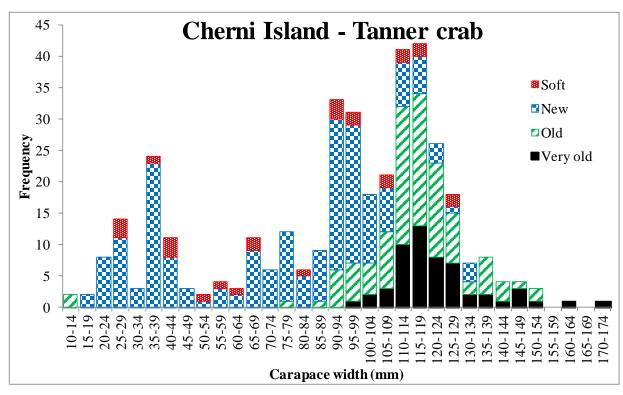


Figure 22.– Size frequency of male Tanner crab west of Cherni Island by shell condition, 2016.

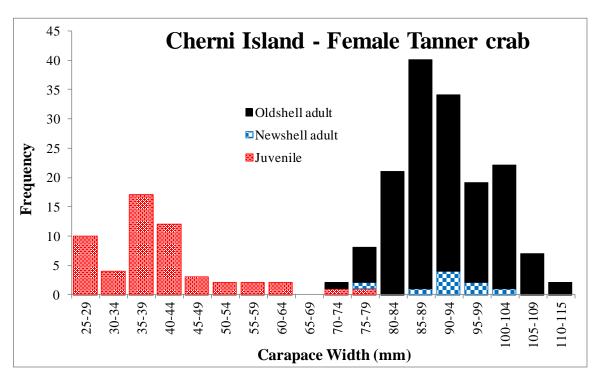


Figure 23.– Size frequency of juvenile and mature female Tanner crab west of Cherni Island, 2016.

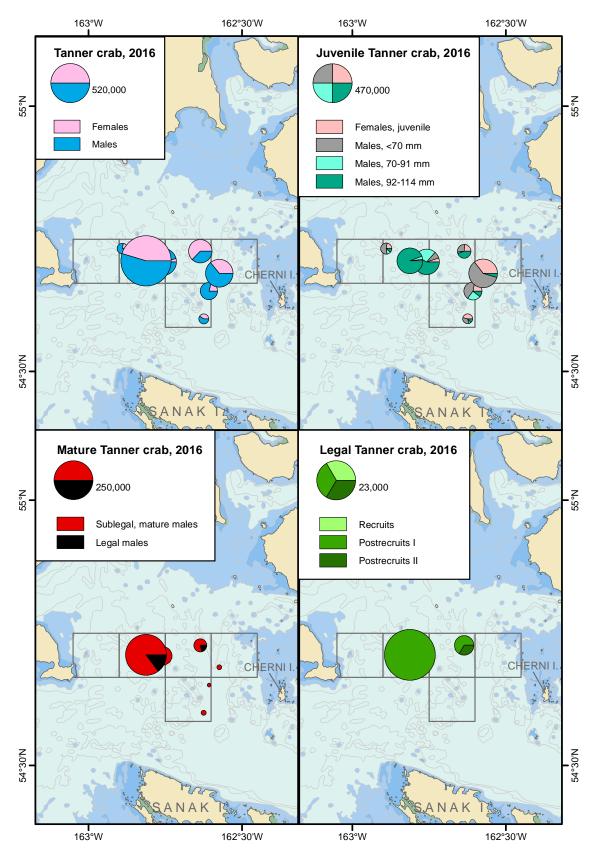


Figure 24.– Total abundance estimates of Tanner crab west of Cherni Island, 2016.